GEORGIA STATE UNIVERSITY

DEC 8 1975

LIBRARY.

SELECTED

SOURCESRESOURCES ABSTRACTS



VOLUME 8, NUMBER 22 NOVEMBER 15, 1975 SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

SELECTED WATER RESOURCES ABSTRACTS is available to Federal agencies, contractors, or grantees in water resources upon request to: Manager, Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior, Washington, D. C. 20240.

SELECTED WATER RESOURCES ABSTRACTS is also available on subscription from the National Technical Information Service. Annual subscription rates are: To the SWRA Journal, \$75 (\$95 foreign); to the Journal & Annual Index, \$100 (\$125 foreign); to the Annual Index only, \$50 (\$65 foreign). Certain documents abstracted in this journal can be purchased from the NTIS at prices indicated in the entry. Prepayment is required.

SELECTED

WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Research and Technology, U.S. Department of the Interior



VOLUME 8, NUMBER 22 NOVEMBER 15, 1975

W75-10851 -- W75-11350

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

KIN MININ 31/31 L DINI MINING

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the Water Resources Thesaurus. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCU-MENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center Office of Water Research and Technology U.S. Department of the Interior Washington, D. C. 20240

CONTENTS

FOREWORD	iii
----------	-----

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER

Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE

Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION

Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL

Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION

Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING

Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA

Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS

Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES

Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION

Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

T the ca

free cy co flu con proper was snow one (ph of employment)

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

MAN'S INFLUENCE ON THE HYDROLOGICAL CYCLE: A DRAFT REPORT OF THE UNESCO/FAO WORKING GROUP ON THE IN-TERNATIONAL HYDROLOGICAL DECADE

Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Develop-

Food and Agriculture Organization of the United Nations, Rome, Water Resources and Develop-ment Service, Land and Water Development Division, Irrigation and Drainage Paper, Special Issue No 17, 1973. 71 p.

Descriptors: *Hydrologic cycle, *Environmental effects, *Water resources development, *Hydrologic data, *Water management(Applied), Arid lands, Europe, Asia, North America, South America, Australia, Africa, Engineering, Irriga-tion, Groundwater, Reservoir evaporation, Social aspects, Hydrologic properties, Land use.

Three essays explored consequences of human interference with the hydrological cycle. Man's efforts to control the world's water cycle involves factors other than hydrology and engineering; ecological, sociological, economic, cultural, and political considerations and forces must also be taken into account. The first paper explains the hydrological cycle of the waters of the earth. A following section details human impact on the hydrological cycle and finds this impact increasingly negative; pollution of water and air, salinization of irrigation districts, mining of groundwater in arid lands, and potential threats to the stability of the hydrologic regime which to date has sustained human life. The book concludes with an examination of man's greatest obstacle in realizing his hydrologic dreams; man. Examples of international and national failures in planning and executing water projects and the prospects presented by growing pollution and population are discussed. (See W75-10864 thru W75-10866) (Bowden-Arizona) W75-10863

THE NATURE AND COMPONENTS OF THE HYDROLOGICAL CYCLE,

University Coll., Dublin, (Ireland). Dept. of Civil

Engineering.

In: Man's Influence on the Hydrological Cycle, Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper Special Issue No 17, p 1-18, 1973. 1 fig, 4 tab, 31 ref.

Descriptors: *Hydrologic cycle, *Hydrologic data, *Environmental effects, *Hydrologic properties, radiation, Atmosphere, Evaporation, Transpiration, Groundwater, Precipita-tion(Atmospheric), Movement, Soil water, Chemical reactions, Physical properties, Biological properties, Water pollution effects, Water storage, Infiltration, Surface waters.

Hydrologic interests focus on transfer of water from one form to another. In the hydrological cycle, the total amount of global water remains constant. Movement of water in the cycle is influenced by the supply of energy in the form of incoming solar radiation. Individual hydrological processes of precipitation, evaporation and trans-piration, infiltration and surface storage, soil water, groundwater, channel and lake storage and snow and ice conditions are discussed, describing how these processes are capable of changing from one hydrologic aspect to another. The secondary (physical, chemical, biologic and pollution) effects of water on human environment are illustrated, emphasizing the consequences which can result from modification of the hydrological cycle by human activity. (See also W75-10863) (Michael-Arizona) W75-10864

BALANCING THE EFFECTS OF MAN'S AC-TIONS ON THE HYDROLOGICAL CYCLE,

Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant

A. B. Costin, and J. C. I. Dooge.
In: Man's Influence on the Hydrological Cycle, Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper Special Issue No 17, p 19-51, 1973. 2 fig, 64 ref.

Descriptors: *Hydrologic cycle, *Hydrologic aspects, *Land use, *Urbanization, *Water *Land use, management(Applied), Topography, Water storage, Surface runoff, Soil erosion, Surface waters, Soil water, Evapotranspiration, Percolation, Weather modification, Evaporation control, Transpiration control, Irrigation, Saline water, Drainage practices, Desalination, Forestry, Water

Identifiers: Moisture interception, Thames River, Mekong River.

Water, the most manageable of the natural resources, is capable of diversion, transport, storage and recycling. However, great care must be taken in developing one aspect of the hydrologi-cal cycle so that other hydrologic components are adversely affected. Hydrological changes not adversely affected. Hydrological changes resulting from land use practices are discussed, showing how readily terrain alterations affect precipitation, surface, and sub-surface waters. Man's attempts to control hydrological processes by weather modification, evaporation and transpiration controls, control of soil water movement, engineering techniques to increase availability, and irrigation and drainage often have considerable side effects. Natural hydrologic processes can be greatly upset by practices which seem superfi-cially beneficial, including desalination, forestry practices and urbanization. Examples of pollution effects are presented for the Thames and Mekong Rivers. The need for logical decisions in water management is vital and any alteration of one hydrological component must take into consideration all others. (See also W75-10863) (Michael-Arizona) W75-10865

HUMAN OBSTACLES TO THE CONTROL OF THE HYDROLOGICAL CYCLE FOR THE

BENEFIT OF MAN,
Technion - Israel Inst. of Tech. Haifa (Israel). Dept. of Agricultural Engineering

In: Man's Influence on the Hydrological Cycle, Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper Special Issue No 17, p 53-69, 1973.

Descriptors: *Hydrologic cycle, *Administrative decisions, *Water law, *Legislation, *Water resources development, Legal aspects, Water allo-cation(Policy), Water rights, Water policy, Water management(Applied), Government.

Many of the world's hydrological problems are due to inefficient and ineffectual management of development projects. Political, historic and nationalistic factors often weigh heavily on development decisions. Many world wide hydrological problems result from inadequate international legislation and enforcement. On a national level, conflicts often arise between urban, industrial and agricultural interests. Economic and financial troubles internationally and locally often limit water development projects. The central problem of hydrological development is population increase. Due to the annual population growth rates in developing countries, hydrological development programs are often obsolete before completed. Effective planning of hydrological resource development must overcome grave human obstacles in-cluding data gaps and education, training, and ability deficits in developing countries. (See also W75-10863) (Michael-Arizona) W75-10866

PREDICTING RECESSIONS THROUGH CON-VOLUTION.

Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center. For primary bibliographic entry see Field 2E. W75-10917

SUBSURFACE FLOW FROM SNOWMELT TRACED BY TRITIUM.

Swiss Federal Inst. for Snow and Avalanche Research, Davos-Weissfluhjoch. For primary bibliographic entry see Field 2F. W75-10921

THE HYDROLOGIC CYCLE--AS APPLICABLE

TO THE PACIFIC NORTHWEST, Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 7C. W75-10949

MOISTURE AND ENERGY CONDITIONS IN A DRAINING SOIL MASS,

Georgia Univ., Athens. School of Forest Resources.

For primary bibliographic entry see Field 2G. W75-11054

PROCESS STUDIES AND MODELING OF SELF-CLEANING CAPACITY OF MOUNTAIN CREEKS FOR RECREATION PLANNING AND

MANAGEMENT, Utah State Univ., Logan. Dept. of Civil and Environmental Engineering

For primary bibliographic entry see Field 5B. W75-11055

MULTILAG MARKOV MODELS FOR EAST-

ERN AUSTRALIAN STREAMS, New South Wales Univ., Kensington (Australia). School of Civil Engineering. For primary bibliographic entry see Field 2E. W75-11301

DETECTION OF CHANGE IN SEQUENCES OF HYDROLOGIC DATA.

Melbourne and Metropolitan Board of Works (Australia).

For primary bibliographic entry see Field 7C. W75-11302

GENERATION OF ARID ZONE RAINFALL

AND RUNOFF, University of New England, Armidale (Australia). School of Natural Resources. I. H. Fisher.

In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 90 - 94, May 1975. 2 fig. 1

*Rainfall-runoff relationships. Descriptors: *Synthetic hydrology, *Pasture management, *Arid lands, *Australia, Computer models, Grazing, Water balance.

In an investigation of optimal management policies for livestock grazing a large paddock in arid southern Australia, a model using synthetic daily rainfall input was required to simulate runoff from, and the wide variation of soil moisture in, the paddock. Some problems associated with the

Field 2-WATER CYCLE

Group 2A-General

development of such a model are outlined. A statistical analysis of historical rainfall is presented which supports the separation of the generation of the occurrence of wet and dry days from the determination of the magnitude of the nonzero daily rainfalls when constructing synthetic traces. Modifications made to an existing model to include only those processes important in arid conditions are discussed. Also described is a method devised to allow for horizontal transfer of runoff within a paddock between subdivisions relating to factors of importance to both water balance (CSIRO) and grazing management policies. W75-11303

2B. Precipitation

WATER RESOURCE OBSERVATORY CLI-MATOLOGICAL DATA, WATER YEAR 1973. Wyoming Univ., Laramie. Water Resources Research Inst.

For primary bibliographic entry see Field 7C. W75-11035

ANALYSIS OF COLORADO PRECIPITATION

Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.

M. Kuo, and S. K. Cox

Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 717, \$3.75 in paper copy, \$2.25 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report Series No 63, June 1975. 36 p. 10 fig, 9 tab, 7 ref. OWRT A-018-COLO(2).

Descriptors: *Precipitation(Atmospheric), *Storms, *Colorado, Data collections, Spatial dis-tribution, Temporal distributions, Seasonal, Thunderstorms, Distribution patterns

The precipitation trend in Colorado was studied statistically using 56 years of data collected at 61 stations. The precipitation had an annual decrease of 0.01 inches over the 56 year period although this result was not statistically significant. Precipitation periods (referred to as storms) were used to describe the variation of the precipitation in space and time. The state of Colorado was divided into and time. The state of Cobrado was divided mid-six geographic regions, and area weighted hourly precipitation data were summed to obtain the volume of water yielded by each storm. It was found that 80% of the annual volume is produced by 30% of the storms. The western third of the state shows no marked seasonal variation in precipitation, but its southern half receives more precipitation than its northern half. The middle third of the state receives 60% of its precipitation in the summer, and the eastern part, the high plains, receives 80% during the summer months. Thunderstorms predominate during the summer, large scale storms in the winter. The summer precipitation volume is correlated with the annual volume in all regions. After categorizing the storms by their precipitation volume, it was found that wetter years contain more storm events of all circums they discontinuously with ne articachter. sizes than the driest years with no noticeable change in the distribution of the size of the storms. (Martin-Colorado State) W75-11040

AN ELEVATIONAL CONTROL OF PEAK

SNOWPACK VARIABILITY,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research; and Colorado Univ., Boulder.
Dept. of Geography.
For primary bibliographic entry see Field 2C.
W75-11155

CONDENSATION IN JETS, INDUSTRIAL PLUMES AND COOLING TOWER PLUMES, Waterloo Univ. (Ontario). Dept. of Mechanical Engineering. T. M. L. Wigley.

Journal of Applied Meteorology, Vol 14, No 1, p 78-86, February 1975. 7 fig, 3 tab, 15 ref, append.

Descriptors: *Condensation, *Jets, *Cooling towers, "Saturation, Buoyancy, Drops(Fluids), Supersaturation, Humidity, Precipita-tion(Atmospheric), Temperature, Pressure, En-vironment, Fallout, Equations, Mathematical stu-

Identifiers: Cooling tower plumes, Industrial

The one-dimensional theory for the condensation of buoyant plumes was extended to include supersaturation as an extra variable. An additional equation describing the dynamics of droplet growth was used to make the system tractable. Some simple mathematical results were obtained which allowed the theory to be related to, and so extended, a commonly used graphical representation of the condensation process. The theory was then simplified to a single nonlinear first-order differential equation for the condensed water content. This was solved numerically for a typical jet, scrubbed industrial plume, and natural-draft cooling tower plume to obtain down-plume profiles of condensed water content, supersaturation, and mean droplet size. High supersaturation was predicted in all three cases, corresponding to mean relative humidities of up to 170% (jet), 150% (scrubbed plume), and 105% (cooling tower). These results may be important in predicting the growth of 'foreign' carry-over droplets in plumes from industrial sources or cooling towers. Predictions of plume length in these cases was found to be insen-sitive to supersaturation, but plume length was noticeably affected by supersaturation in the case of a jet. In the examples considered maximum mean droplet radii never exceeded 10 micrometers which supports the belief that rainout is caused primarily by carry-over from imperfect mist eliminators. (Jones-ISWS) W75-11166

CHARGED DROPLET COLLISION EFFICIEN-CY MEASUREMENTS,

National Center for Atmospheric Research, Boulder, Colo. C. E. Abbott.

Journal of Applied Meteorology, Vol 14, No 1, p 87-90, February 1975. 4 fig, 1 tab, 10 ref.

Descriptors: *Drops(Fluids), *Laboratory tests, *Cloud physics, Efficiencies, Measurement, Photography, Instrumentation, Evaluation, *Cloud pay...
Photography, Instrumentation...
Analytical techniques.
Identifiers: *Collision efficiencies, Charged

Experimental measurements were presented for collision efficiencies of highly charged droplets The drop sizes studied ranged in radius from 10 to 25 micrometers and carry charges of the order of 10 to the 4th power esu. Measured collision efficiencies greater than 100 agreed well with those predicted by Paluch's analytical solution for collision efficiency upper limit. For smaller values, the collision efficiencies predicted from Davis and from Davis and Sartor exceeded those measured. (Jones-ISWS) W75-11168

RELATIONS AT MARMOT WIND-SNOW CREEK, ALBERTA,

Atmospheric Environment Service, Calgary (Alberta). For primary bibliographic entry see Field 2C. W75-11226

DETECTION OF CHANGE IN SEQUENCES OF HYDROLOGIC DATA,

Melbourne and Metropolitan Board of Works (Australia). For primary bibliographic entry see Field 7C. W75-11302

SOME OBSERVATIONS ON RAINFALL IN WESTERN NEW SOUTH WALES,

New South Wales Univ., Kensington (Australia). School of Wool and Pastoral Sciences S. J. Filan.

In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 95-98, May 1975. 11 ref.

Descriptors: *Rainfall, *Probability, *Forecasting, *Arid lands, *Australia, Statistical methods, Decisions making, Sheep, Marketing, Sampling, Esti-

Identifiers: New South Wales.

Probability distributions for monthly rainfall at several western New South Wales sites were required for constructing a simulation model of sheep and wool production and a model for timeof-marketing decisions for sheep. Standard forms of distribution function were found to fit the data fairly well, but there were some systematic depar-tures. It was not possible to test the possibility that this was due to mixed distributions; however, it was established that the data exhibit autocarrelawas established that the dual exhibit adoctaries that normal sampling and estimation procedures are of uncertain reliability. The autocorrelation could be expressed in terms suitable for application in decision-making within the pastoral industries (CSEQ). try. (CSIRO) W75-11304

ASPECTS OF RAINFALL MEASUREMENT IN A NEW ENGLAND LOCATION, University of New England, Armidale (Australia). Si tie

T

m

va

Sa

to

ma bel

sug 410

the

var

top W7

WI

CR

Atn (All

Des

man

relat

Win

in th

trap

of th

Maxi favor

avera

than

eleva

Biolo W75-

Dept. of Geography.

I. J. Jackson. Australian Meteorological Magazine, Vol 22, No 2, p 37 - 47, June 1974. 3 fig, 8 tab, 13 ref.

Descriptors: *Rain gages, *Gaging stations, *Rainfall, Measurement, *Australia.

An experiment to assess the impact of mounting and site on rain-gauge catch is described. Factors considered include site exposure and slope, and mounting horizontally or parallel to the slope. When compared to the magnitude of random variations between gauges mounted on a site at a height of 30.5 cm, the influence of mounting and siting was not as great as might have been anticipated. (CSIRO) W75-11309

2C. Snow, Ice, and Frost

DIFFERENTIAL RELEASE OF WATER FROM ARIZONA SNOWPACKS,

Arizona Univ., Tucson. Dept. of Watershed Management. M. E. Jones.

Arizona University, Tucson, Department of Watershed Management, MS Thesis, 1974. 53 p, 4 fig, 1 tab, 2 append, 25 ref.

Descriptors: *Snowmelt, *Lysimeters, *Arizona, *Melt water, *Snow management, Snowpacks, Runoff, Snow, Melting, Water sources, Water supply, Discharge(Water), Arid climates, Semiarid climates, Ponderosa pine trees.

Installation of Haupt volumetric snow lysimeters in open and forested areas of Arizona showed that the winter season snowmelt outflow for all sites was 9.8 inches and runoff efficiency was 68 percent. The estimated average daily snowmelt out-flow was 0.2 inches per day and 0.4 inches per day now was 0.2 inches per day and 0.4 inches per day maximum. The snow lysimeters were used in a study to identify optimum sites for melt water yield in terms of forest overstories. Identification of such sites would provide a guide toward minimizing the ratio of vapor to liquid water loss from the snowpacks. (McLachlan-Arizona) W75-10860 AN ASSESSMENT OF SNOWPACK DEPLE-TION-SURFACE RUNOFF RELATIONSHIPS ON FORESTED WATERSHEDS, Arizona Univ., Tucson. School of Renewable

Natural Resources.

For primary bibliographic entry see Field 4A. W75-11049

WEYL'S THEORY OF GLACIATION SUP-PORTED BY ISOTOPIC STUDY OF NORWEGI-AN CORE K 11.

Centre National de la Recherche Scientifique, Gifsur-Yvette (France). Centre des Faibles Radioac-

For primary bibliographic entry see Field 2J. W75-11153

AN ELEVATIONAL CONTROL OF PEAK SNOWPACK VARIABILITY, Colorado Univ., Boulder. Inst. of Arctic and Al-

pine Research; and Colorado Univ., Boulder. Dept. of Geography.

Water Resources Bulletin, Vol 11, No 3, p 613-621, June 1975. 4 fig, 3 tab, 11 ref. Bureau of Reclamation Contract 14-06-D-7052.

Descriptors: *Snowpacks, *Mountains, *Snow surveys, *Variability, *Colorado, Snow cover, Snow, Elevation, Snowfall, Snowmelt, Weather modification, Model studies, Regression analysis, Correlation analysis, On-site investigations, Measurement, Meteorology, Precipitation(Atmospheric).

Identifiers: *San Juan Mountains(Col), Snow ac-

The records of the seasonal peaks in snow accumulation on 24 snow courses showed that the relative variability (measured by the coefficient of variation) is inversely related to elevation in the San Juan Mountains in southwestern Colorado. Analysis on an annual basis showed that this is due to a tendency for the peak snowpack at high elevations to be closer to the long-term mean, while at low levels, peak snowpack is further from the nor-mal. This was true in both above-normal and below-normal accumulation seasons. Extrapola tion of 20 annual elevation-accumulation trends suggests that mean accumulation is reached at + or -186 m elevation. This is approximately the height of the topographic barrier of the San Juan Mountains, suggesting that the pattern of variability is a partial function of an atmospherictopographic interaction. (Sims-ISWS) W75-11155

WIND-SNOW RELATIONS AT MARMOT CREEK, ALBERTA,

Atmospheric Environment Service, Calgary (Alberta). D. Storr

Can J For Res. Vol 3, No 4, p 479-485, 1973, Illus.

of

na.

ks.

ter

ric

PES

that

perout-

day

ater

tion

ward

Descriptors: *Canada, Snow, Wind, *Snow management, *Snowfall, *Wind velocity, Forest management, Clear-cutting.

Identifiers: *Marmot Creek(Alberta), *Snow-wind relationships.

Wind patterns are crucial factors to be considered in the design of artificial clearings in the forest to trap and retain snow. Winds at Marmot Creek (Alberta, Canada) during snowfall are predominantly southeasterly but are quite light; over 80% of the snow falls with winds less than 4.5 m/s. Maximum winds occur between snowfalls, and favor the southwest to northwest quadrant. The average maximum hourly wind per month is less than 7 m/s in the lower reaches but increases with elevation to 16 m/s at treeline.--Copyright 1974, Biological Abstracts, Inc. W75-11226

HOW BP ALASKA CEMENTS THROUGH PER-MAFROST.

For primary bibliographic entry see Field 8F. W75-11278

HYDROLOGIC RELATIONS UNDISTURBED AND CONVERTED BIG SAGEBRUSH LANDS: THE STATUS OF OUR KNOWLEDGE

Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. For primary bibliographic entry see Field 4D. W75-11313

2D. Evaporation and Transpiration

EVAPOTRANSPIRATION OF FOUR FOREST TYPES MEASURED WITH THE EDDY CORRELATION TECHNIQUE,

Washington Univ... Seattle. Coll. of Forest Resources.

L. J. Fritschen, H. R. Holbo, and M. O. Smith Available from the National Technical Informa tion Service, Springfield, Va 22161 as PB-244 695, \$3.75 in paper copy, \$2.25 in microfiche. Completion Report, June 24, 1975. 24 p, 7 fig, 2 tab, 9 ref. OWRT A-061-WASH(1). 14-31-0001-4048.

Descriptors: Eddies, Instrumentation, Measurement. Canopy. *Evapotranspiration, *Forests, Descriptors: Edules, instrumentation, Measure-ment, Canopy, "Evapotranspiration, "Forests, Meteorology, Design, Analytical techniques. Identifiers: "Eddy correlation technique, Forest canopies, Sensible heat flux, Spectral analysis,

Eddy correlation instrumentation for evapotranspiration estimation from forest canopies has been evaluated. The frequency response of the Gill-type propeller is probably adequate for obtaining verti-cal windspeeds, but fine glass-bead thermistors are not fast enough to capture the temperature fluctuations. A fluxatron for the direct assessment of the sensible heat flux was designed and built. In comparison with covariance and cospectral com-putations made from high frequency data, the fluxatron exhibited a good potential for independently forming and outputing flux estimates. Spectral analyses of the turbulence above the canopy show a wide range of frequencies, extending much lower in frequency than those normally reported. As a consequence, the bandwidth of the fluxatron must be increased. Due to the short wavelength of some of the turbulence, it will also be necessary to mount the anemometer and the thermometer as close together as practicable. W75-11044

THE MEASUREMENT AND ESTIMATION OF LAKE EVAPORATION FROM FOUR AUSTRALIAN WATER STORAGES,

Bureau of Meteorology, Melbourne (Australia). E. D. Hoy, and S. K. Stephens.

In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 70-74, May 1975. 4 fig, 3 tab,

Descriptors: *Evaporation, *Lakes, *Estimating, Water loss, Reservoirs, Measurement, Heat balance, Evaporation pans, *Australia, Data col-

Identifiers: Lake Eucumbene(NSW), Cataract Reservoir(NSW), Manton Reservoir(NT), Mundaring Reservoir(WA).

Estimates of lake evaporation by the bulk aerodynamic method and the pan conversion method have been evaluated relative to the heat budget method at four Australian lakes. The results for Lake Eucumbene, Cataract Reservoir and Mundaring Reservoir gave standard errors of estimate of 10% in monthly totals of lake evapora-tion calculated from both methods. At Manton Reservoir only the bulk aerodynamic method has

been shown to estimate monthly lake evaporation totals with a standard error estimate of 10%. Monthly totals of pan evaporation and lake evaporation are presented for all lakes. (CSIRO) W75-11300

2E. Streamflow and Runoff

MEASUREMENT OF COBBLE ABRASION IN NATURAL STREAMS,

Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.

For primary bibliographic entry see Field 2J. W75-10881

FLOOD RUNOFF FROM URBAN AREAS.

Maryland Univ., College Park. Dept. of Civil Engineering.

For primary bibliographic entry see Field 5B. W75-10904

AUTOMATED DISTRIBUTION OF GAUGE AND SHIFT CORRECTIONS,

Department of the Environment, Ottawa (Ontario), Water Resources Branch. For primary bibliographic entry see Field 7C. W75-10911

FLOW FILE OPERATIONS MANUAL,

Department of the Environment, Ottawa (Ontario). Water Resources Branch For primary bibliographic entry see Field 7C. W75-10913

AUTOMATED HOURLY COMPUTATIONS,

Department of the Environment, Ottawa (Ontario). Water Resources Branch. For primary bibliographic entry see Field 7C. W75-10915

PREDICTING RECESSIONS THROUGH CON-

VOLUTION, Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center. P. Yates, and W. M. Snyder.

Water Resources Research, Vol 11, No 3, p 418-422, June 1975. 13 fig, 2 tab, 11 ref.

Descriptors: *Recession curves, *Hydrographs, *Streamflow, *Base flow, *Methodology, Optimization, Hydrologic data, Model studies, Watersheds(Basins), Groundwater.

Identifiers: *Convolution method, *Ahoskie Creek(NC)

Streamflow during recessions, that is, during periods of little or no rain, represents a dependable minimum supply of water. However, quantitative mathematical expressions are still lacking for predicting flow during recession periods. A convolutional model of streamflow recession was formulated and tested utilizing sequential values of mean daily discharge, Parameters of the model were determined by optimization wity historical streamflow records. Preliminary relationships of parameters to rate of flow and size of drainage area were explored. (Singh-ISWS) 75-10917

IMPLICIT NUMERICAL MODELING OF UN-STEADY FLOWS,

North Carolina State Univ., Raleigh, Dept. of Civil Engineering. For primary bibliographic entry see Field 8B.

W75-10925

Field 2-WATER CYCLE

Group 2E-Streamflow and Runoff

RELATIVE IMPORTANCE OF DECISION VARIABLES IN FLOOD FREQUENCY ANALY-

IBM Watson Research Center, Yorktown Heights, N.Y.

For primary bibliographic entry see Field 4A. W75-10929

STREAMFLOW IN THE NEW YORK PART OF THE SUSQUEHANNA RIVER BASIN,

HE SUSQUEITANNA RIVER BASIN, Geological Survey, Albany, N.Y. H. F. H. Ku, A. D. Randall, and R. D. MacNish. New York State Department of Environmental Conservation, Albany, Bulletin 71, 1975. 130 p, 31 fig, 10 tab, 60 ref, 4 append.

Descriptors: *Streamflow, *Hydrologic data, *New York, *Watershed management, Evaluation, Runoff, Discharge(Water), Flow duration, Roof, Discharge(water), Flow duration, Flood frequency, Droughts, Water quality, Water utilization, Water demand, Correlation analysis. Identifiers: *Susquehanna River basin(NY), Streamflow summary.

The Susquehanna River basin occupies about 6,500 square miles in south-central New York. Continuous records of streamflow at 60 gaging stations are summarized by tables of flow duration and low-flow frequency for the 1931-60 standard period and (or) for periods of record through 1959 and 1967. Similar statistics are developed by correlation for 110 partial-record stations. Record low flows for one or more periods were set at 26 of 37 long-term gaging stations during the drought of the 1960's, and the cumulative runoff deficiency equaled 1-1/2 years of normal runoff. Maps of annual precipitation and runoff show that precipitation is several inches greater in the eastern part of the basin than in the western part, but evapotranspiration is slightly greater in the west. Requirements for within-year and carryover storage with 2- to 10-percent risks of deficiency are presented for gaged sites and may be estimated for ungaged sites from low-flow and mean-runoff parameters. Flood magnitude and frequency at gaging stations are summarized, and three regions are defined within which floods on major streams have a consistent relation to basin size. (Woodard-USGS) W75-10931

TEMPERATURES OF KANSAS STREAMS,

Geological Survey, Lawrence, Kans

Kansas Water Resources Board, Topeka, Streamflow Characteristics Technical Report No 12, July 1975, 220 p

Descriptors: *Water temperature, *Kansas, *Basic data collections, Gaging stations, Sites, Streamflow, Discharge(Water), Hydrologic data, Correlation analysis.

Identifiers: *Water temperature frequency dis-tribution, Discharge frequency distribution, Average temperatures, Maximum temperatures, Minimum temperatures.

Water temperature observations in Kansas, made in conjunction with discharge measurements, are presented for the period of record beginning with three stations in 1948 and increasing to about 240 stations by 1972. Water temperature data for each station are summarized both monthly and for the period of record giving the mean, standard deviation, range between maximum and minimum, and number of observations. Graphs show the frequency distributions of time of observation, discharge, and temperature. A plot of temperature versus data illustrates the distribution of all observed data available during 1948-72. (Woodard-USGS) W75-10933

ESTIMATED AVAILABILITY OF SURFACE AND GROUND WATER IN THE POJOAQUE

RIVER DRAINAGE BASIN, SANTA FE COUN-TY, NEW MEXICO.

Geological Survey, Albuquerque, N. Mex For primary bibliographic entry see Field 4A. W75-10938

LOW-FLOW CHARACTERISTICS OF SELECTED STREAMS IN NORTHEASTERN WASHINGTON.

Geological Survey, Tacoma, Wash.

D. E. LaFrance.

Open-file report, 1975. 22 p, 6 fig, 1 plate, 4 tab, 7

*Washington, *Low Descriptors: flow. *Streamflow, Analytical techniques, Regression analysis, Average flow, Low flow frequency, Gaganalysis, Average flow, 100 flow flowers ing stations, Data collections, Hydrologic data, Correlation analysis, Hydrographs, Maps, Sites, Precipitation(Atmospheric), Water utilization, Precipitation(Atmospheric), Water u Watershed management, Water demand. Identifiers: 7-day flows.

Low-flow-frequency curves developed from streamflow records at nine continuous-recording gaging stations in northeast Washington were used to determine discharges for low-flow frequencies of 7, 30, 60, 90, and 183 days. Computed for the nine gaging stations and tabulated in the report are low-flow-frequency data for the 7-day low flows and monthly average low flows at the 2-year recurrence interval. Regression techniques used to esti-mate the 7-day low flows at 103 miscellaneous short-term sites indicate that correlation coefficients for all except three sites equaled or exceeded 0.90. Low flows varied widely from year to year, as indicated by slope indexes ranging from 1.16 to 8.16 among the 103 miscellaneous sites. The day low flow of the Colville River at Kettle Falls during the periods 1924-32 and 1934-71 ranged from a minimum of 5.29 cfs in 1931 to a maximum of 128 cfs in 1949. (Woodard-USGS) W75-10939

ESTIMATED MEAN-MONTHLY AND ANNUAL RUNOFF AT SELECTED SITES IN THE POJOAQUE RIVER DRAINAGE BASIN, SANTA FE COUNTY, NEW MEXICO,

Geological Survey, Albuquerque, N. Mex. L. J. Reiland.

Open-file report 74-150, June 1975. 21 p, 1 fig, 3

*Streamflow, *Natural Descriptors: *Average flow, *Regression analysis, *New Mexico, Natural streams, Estimating, Runoff, Correlation analysis, Gaging stations, Hydrologic data, Methodology.

Identifiers: *Santa Fe County(N Mex), Ungaged

Estimates are shown for natural mean-monthly and annual runoff at 6 selected sites in the Pojoaque River drainage basin, Santa Fe County, N. Mex. Natural runoff is defined as the runoff that would occur if there were no manmade changes. The sites are: Rio Nambe at Nambe Falls, near Nambe; Rio Nambe near Nambe, plus Nambe canal; Rio En Medio at Nambe Pueblo boundary; Rio Chupadero at Nambe Pueblo boundary; Rio Tesuque at Tesuque Pueblo boundary; and Pojoaque River at mouth. Techniques of regression analysis and runoff-elevation relationships were used to estimate runoff where no streamflow records or only short-term records are available. Comparison of estimated mean-annual runoff, using these techniques, with mean-annual runoff obtained from streamflow records at gaged stations within and near the area indicated that the estimated mean-annual runoff at sites unaffected by excessive channel loss was generally within 10 percent, or less, of the gaged runoff. The natural process, or ress, or the gaged runoff. The natural runoff calculated for each of the six sites is be-lieved to be equivalent to runoff for the water years 1920-1968. (Woodard-USGS) W75-10943 SOME RESULTS ON MASS TRANSFER PROCESSES IN A DENSITY-STRATIFIED

Mississippi Univ., University. Dept. of Mechanical Engineering. For primary bibliographic entry see Field 8B. W75-11057

EFFECT OF PRESSURE GRADIENT ON WIND-WAVES IN A LABORATORY CHANNEL,

Connecticut Univ., Storrs. Dept. of Civil En-For primary bibliographic entry see Field 8B. W75-11093

TRANSITION IN OSCILLATORY FLOW OVER RIPPLED BEDS,

Cambridge Univ., (England). Dept. of Engineer-

For primary bibliographic entry see Field 8B. W75-11149

DERIVATION OF SURFACE WATER LAG TIME FOR CONVERGING OVERLAND FLOW, New Mexico Inst. of Mining and Technology, Socorro

V. P. Singh. Water Resources Bulletin, Vol 11, No 3, p 505-513. June 1975. 2 fig. 5 ref.

Descriptors: *Time lag, *Overland flow, *Mathematical studies, Basins, *Rainfall intensity, Mannings equation, Chezy equation, Momentum equation, Theoretical analysis, Surface waters, Watersheds(Basins), Hydrodynamics, waters, Watersheds *Watersheds(Basins).

Identifiers: *Kinematic wave theory, Converging overland flow

Lag time was defined as the lapse between the time of occurrence of 50% input and 50% output. Generalized and special forms of explicit analytical solutions of surface water lag time were derived for converging overland flow, utilizing the kinematic wave theory which comprises equations of continuity and motion. These solutions related lag time to physically measurable quantities of a watershed, including surface roughness and geometrical parameters. Expressions for lag time were derived both from Manning's and Chezy's equations. Hydrologically similar basins exhibit similar lag time behavior. A similarity factor was defined for comparing basins. (Singh-ISWS) W75-11156

ref

De*F

no.

Re ty

ten

sq

syn

rec trib

of s

AUS

Nev

(Au R. F

1975 Prep

Des

desi

Fron (Aus plan

LABORATORY INVESTIGATION OF ONE-DIMENSIONAL WAVE MOTION IN OPEN CHANNELS.

Tennessee Univ., Knoxville. Coll. of Engineering. For primary bibliographic entry see Field 8B. W75-11172

MULTILAG MARKOV MODELS FOR EAST-ERN AUSTRALIAN STREAMS, New South Wales Univ., Kensington (Australia).

School of Civil Engineering.

G. L. Wright.

In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 75-79, May 1975, 1 fig, 3

Descriptors: *Markov processes, *Streamflow, *Statistical models, Rivers, *Australia, Synthetic hydrology, Analytical techniques. Identifiers: Victoria, New South Wales, Queen-

An examination has been made of the validity of lag-one Markov schemes which are commonly used in synthetic streamflow generating models. It has been shown, by consideration of the partial autocorrelation functions calculated for twelve Australian rivers, that persistence effects for greater than lagsone are not usually insignificant. On the other hand, after comparing synthetic streamflow sequences produced by Markov schemes up to lag-twelve, no appreciable improvement was found for schemes greater than lag-one. (CSIRO) W75-11301

DROUGHTS, DISTRIBUTIONS AND DEPEN-DENCE: AN ANALYSIS OF SOME SYNTHETIC DATA GENERATION METHODS,

New South Wales Univ., Kensington (Australia). School of Civil Engineering.

D. G. Doran.

In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 85 - 89, May 1975. 3 fig, 4

Descriptors: *Low flow frequency, *Synthetic hydrology, *Streamflow forecasting, *Australia, Droughts, Streamflow, Time series analysis, Computer models, Monthly.

The incidence of zero flows and the closely related drought-frequency problem are of major concern with Australia's highly emphemeral streams. Generation techniques of modeling monthly streamflow data do not always adequately preserve the properties of the historical data under such conditions. An examination is made of various model-parameter estimation procedures in their application to some Australian streamflow data, and a method of modelling data with a high incidence of zeros is discussed. An application of an efficient extreme-value parameter estimation procedure is proposed as a test of the droughtpreserving ability of various streamflow genera-tion models. (CSIRO) W75-11305

IN DIFFICULTIES GAUGING SMALL CATCHMENTS - A CASE STUDY, New South Wales Univ., Kensington (Australia).

School of Civil Engineering. D. H. Pilgrim, and B. A. Cornish

In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 99 - 103, May 1975. 6 fig, 10

Descriptors: *Gaging stations, *Small watersheds, *Flow measurement, *Stream gages, Rainfall-runoff relationships, Stage-discharge relations, Time

Reasons are outlined for the fundamental difficulty in obtaining high quality streamflow data from small catchments. Serious errors may result, but the problems are often not easily recognized. Extensive field and hydraulic model studies on a 0.38 sq km catchment are used to illustrate the difficulty in obtaining high gaugings, problems in synchronization of streamflow and rainfall records, the appreciable magnitude of velocity distribution and head effects relative to the low range of stages for these catchments, and stage lag in the recorder well. (CSIRO) W75-11306

AUSTRALIAN ARID ZONE STREAMGAUGING. New South Wales Dept. of Public Works, Sydney (Australia). Water Supply and Sewerage Branch. R. French, and K. P. Roberts.

In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 104-106, May 1975. 5 ref.

Descriptors: *Arid lands, *Australia, *Network design, *Streamflow, Flow measurement, Stream gages, Gaging stations, Data processing.

From experience gained in the Northern Territory (Australia), questions are raised concerning the planning, establishment and operation of a stream

gauging network which is most likely to produce information useful to the engineer. It is argued that the common view of hydrologic networks as simple sums of men, machinery and physical phenomena is to be abandoned in favor of a systems approach to obtaining data from the hydrometeorologic system. Attention is drawn to the peculiarities of the Australian arid zone and especially to the need to use non-specialists in many tasks and the need to perform hydrologic calculations as the ultimate check of the value of hydrographic data. (CSIRO) W75-11307

VARIABILITY, PERSISTENCE AND YIELD OF AUSTRALIAN STREAMS, Monash Univ., Clayton (Australia). Dept. of Civil

Engineering. T. A. McMahon.

In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers, Australia, Preprints of Papers, p 107-111, May 1975. 12 fig, 3

*Australia, *Streamflow, Descriptors: *Variability, Low flow, Persistence, Water yield, Streams, Discharge(Water), Asia, Europe, North America, Correlation analysis, Duration curves, Water storage, Reservoirs.
Identifiers: Storage-yield relationships.

Low flow hydrologic characteristics of 156 Australian streams were reviewed and results com-pared with Asian, European and North American streams. Coefficients of variation and skewness, serial correlation, low flows as defined by flow duration curves and storage-yield values were studied. Australian streams were considerably more variable than northern hemisphere ones. The coefficient of variation was more highly correlated with other characteristics than the mean flow. Empirical equations relating reservoir-storage capacity per mean annual flow to the coefficient of variation were developed. (CSIRO) W75-11308

2F. Groundwater

HYDROGEOLOGY AND WATER RESOURCES OF MIDDLE KIRKLAND CREEK BASIN, YAVAPAI COUNTY, ARIZONA,

Arizona Univ., Tucson. Dept. of Hydrology and Water Resources For primary bibliographic entry see Field 4B.

W75-10872

SUBSURFACE FLOW FROM SNOWMELT TRACED BY TRITIUM, Swiss Federal Inst. for Snow and Avalanche

Research, Davos-Weissfluhjoch. J. Martinec.

Water Resources Research, Vol 11, No 3, p 496-498, June 1975. 3 fig, 8 ref.

Descriptors: *Subsurface runoff, *Melt water, *Tracers, Groundwater movement, *Tritium, Snow, Runoff, On-site investigations, Infiltration, Discharge(Water), Hydrograph analysis, Lysimeters, Dispersion, Velocity, Radioisotopes, Reces-

Identifiers: *Residence time, Radioactive decay.

An explanation was offered of the apparent discrepency between the small velocities of subsurface flow and the watershed response. Environmental tritium in the hydrological cycle provided evidence for a new insight into the runoff mechanism. By this concept the quick reaction of outflow to a agreement with the long residence time of the infil-trated water. (Visocky-ISWS) W75-10921 DETERMINATION OF REGIONAL HYDRAU-LIC CONDUCTIVITY THROUGH USE OF C-14 DATING OF GROUNDWATER.

Geological Survey, Reston, B. B. Hanshaw, and W. Back.

Reprint from Memoires de l'Association Internationale des Hydrogeologues, Montpellier, France, Vol 10, No 1, p 195-196, September 1974. 3 fig. 7

Descriptors: *Hydraulic conductivity. *Groundwater movement, *Radioactive dating, *Carbon radioisotopes, Tracers, Hydrogeology

In order to model and quantify a hydrologic system, one needs to know the boundary conditions, aquifer thickness, and the regional distribution of the hydraulic conductivity. Obtaining sufficient values for the hydraulic conductivity by means of a few pumping tests, core analyses, and tracer tests, so as to be meaningful on a regional scale, has long been a serious constraint on groundwater modeling. However, by using a form of Darcy's law that relates hydraulic conductivity. porosity, gradient of potentiometric surface, and velocity, it is possible to determine hydraulic conductivity if the other variables are known. Porosity can be estimated by standard methods and hydraulic gradient can be obtained directly from the potentiometric surface. Velocity can be calculated from the C-14 ages of carbonate species dissolved in groundwater. The technique of determining regional hydraulic conductivity distribution solving the equation of groundwater flow was tried in central Florida and gave values of hydraulic conductivity that are in agreement with values obtained by traditional methods. (Knapp-USGS)

GROUND WATER IN THE CORVALLIS-AL-BANY AREA, CENTRAL WILLAMETTE VAL-LEY, OREGON,

Geological Survey, Reston, Va.

F. J. Frank.

Available from Supt. of Documents, GPO, Washington, D.C. 20402, \$1.95 in paper copy. Water-Supply Paper 2032, 1974. 48 p. 9 fig. 2 plate, 7 tab, 13 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrogeology, *Hydrologic data, *Oregon, Water wells, Alluvial aquifers, Well data, Drillers logs, Geology, Water supply, Water yield, Water quality.
Identifiers: *Corvallis-Albany area(Ore), Central
Willamette Valley(Ore).

The Corvallis-Albany area is part of the alluvial plain that lies between the Cascade and Coast Ranges in the central Willamette Valley in northwestern Oregon. The alluvial deposits (sand and gravel) of the valley plain contain the most productive aquifers in the area and are considered to be the only units feasible for large-scale development of groundwater supplies. During 1971 the seasonal decline of water levels from winter to late summer averaged about 10 feet for the alluvial deposits. The seasonal change of storage was estimated to be about 130,000 acrefeet. Of this volume, about 14,000 acre-feet was pumped from wells; the rest was discharged through seeps and springs by evapotranspiration. The difference between pumpage and natural discharge indicates that a great quantity of addi-tional water is available for development. The storage capacity of the alluvial aquifers is estimated to be about 750,000 acre-feet between depths of 10 and 100 feet. Water from the alluvial deposits is chemically suitable for all uses, as is most of the water from perched-water bodies in the older sedimentary and volcanic rocks.
(Woodard-USGS)
W75-10940

Field 2-WATER CYCLE

Group 2F—Groundwater

RECHARGE AREAS OF THE FLORIDAN AQUIFER IN SEMINOLE COUNTY AND VICINITY, FLORIDA, Geological Survey, Tallahassee, Fla.

For primary bibliographic entry see Field 7C.

CONTOUR MAP OF THE BEDROCK SUR-FACE, NEW BRITAIN QUADRANGLE, CON-NECTICUT,

Geological Survey, Hartford, Conn For primary bibliographic entry see Field 7C.

MAP SHOWING DEPTH TO BEDROCK, WORTHINGTON QUADRANGLE, MAS-SACHUSETTS.

Geological Survey, Boston, Mass. For primary bibliographic entry see Field 7C.

MAP SHOWING DEPTH TO BEDROCK, GREENFIELD QUADRANGLE, SACHUSETTS.

Geological Survey, Boston, Mass. For primary bibliographic entry see Field 7C.

MAP SHOWING DEPTH TO BEDROCK, CHESTER QUADRANGLE, MASSACHUSETTS, Geological Survey, Boston, Mass. For primary bibliographic entry see Field 7C. W75-10953

MAP SHOWING DEPTH TO BEDROCK, MOUNT CARMEL QUANDRANGLE, CONNEC-

Geological Survey, Hartford, Conn. For primary bibliographic entry see Field 7C. W75-10954

STUDY OF CRITERIA AND MOI ESTABLISHING OPTIMUM LEVEL STUDY MODELS HYDROGEOLOGIC INFORMATION FOR GROUNDWATER BASIN MANAGEMENT, Minnesota Univ., Minneapolis. Dept. of Geology

and Geophysics. H. O. Pfannkuch.

Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 719, S6.25 in paper copy, \$2.25 in microfiche. Minnesota Water Resources Research Center, Minneapolis, Bulletin No 81, April 1975. 165 p, 27 fig, 4 tab, 94 ref. OWRT A-027-MINN(1).

Descriptors: *Hydrologic data, *Model studies, *Groundwater, *Water management(Applied), Decision making, *Optimization, Simulation analysis, Data collections, Design. Identifiers: *Sensitivity analysis.

Information is a structural part of the decision making process. The role of the information gathering process can best be described as a Bayes' process to improve preposterior distributions in probability assignments that will serve as basis for decision making processes. Hydrogeologic information is characterized by a low degree of predictability and high variability. The general cost structure of the hydrologic information gathering process is represented in information cost curves which are combined with production cost or opportunity loss curves to give total cost curves. These may display a minimum which is the point of diminishing returns at which exploration activi-ties should be ceased. One of the main unsolved problems is the proper definition of a universally applicable unit of information content. Optimum levels of information can only be established when utility functions can be expressed in monetary terms and give rise to clear objective functions. Three case histories were used to develop

guidelines for the design and operation of monitoring systems for special wastes, minimum hydrogeologic information needed in watershed district management, and the need and role of in-formation in the choice and construction of a proposed simulation model for a regional system under complex decision rules. (Waelti-Minnesota) W75-11042

MANAGEMENT OF RETARDATION OF SALT WATER INTRUSION IN COASTAL AQUIFERS, North Carolina State Univ., Raleigh. Dept. of Civil A. I. Kashef.

Available from the National Technical Informa tion Service, Springfield, Va. 22161, as PB-244
721, \$8.75 in paper copy, \$2.25 in microfiche.
Completion Report, July 1975. 281 p, 103 fig, 17
tab, 53 ref. OWRT (C-4061)(No 9013)(2).

Descriptors: *Aquifer management, *Artesian aquifers, *Artificial recharge, *Finite element analysis, *Saline water-freshwater interfaces, *Saline water intrusion, Earth dams, Free surface, Groundwater resources, Optimization, Well spac-

Identifiers: Artesian recharge wells, *Coastal aquifers, Salt water retardation, Finite element mesh, *Hydraulic forces method, Equipotential lines, Freshwater barriers, Rectangular earth sections, Streamlines, Velocity vectors.

The free surface in rectangular earth sections or cores of earth dams were determined by the finite element method using a new technique of horizon-tally displaced mesh. Ten cases were solved and compared with a previously developed and simpler method in which the hydraulic forces were analyzed and which resulted in closed form mathematical solutions. The comparison indicated that the method of hydraulic forces can satisfactorily be used in artesian aquifers to locate the saline water-freshwater interface which is analogous to the free surface in earth dams. The solved cases corresponded to a wide range of coverage of practical conditions. The effects of recharge wells under the transient flow conditions were perimposed on these due to the natural flow in order to determine the degree of salt water retardation. Single wells as well as battery of recharge wells parallel to the coast line were analyzed. In all cases, dimensionless parameters were used to allow for the changes in the pump capacities and the time intervals. Various well locations were examined and in the case of well batteries various spacings were introduced. The optimum conditions corresponding to desired degrees of salt water retardation are indicated. Freshwater bar-riers resulted under certain conditions yet these were outside the scope of this project. W75-11058

DEPRIVATION CONTRIBUTION AND INTER-FERENCE EFFECTS OF MULTIPLE WELLS IN A COMMON AQUIFER,

Oklahoma Univ., Norman. Dept. of Civil En-gineering and Environmental Science. For primary bibliographic entry see Field 4B. W75-11142

URANIUM MINERALIZATION BY GROUND WATER IN SEDIMENTARY ROCKS, JAPAN.

Power Reactor and Nuclear Fuel Development Power Reactor and Nuclear Fuel Development Corp., Tokyo (Japan), Raw Materials Div. K. Doi, S. Hirono, and Y. Sakamaki. Economic Geology, Vol 70, No 4, p 628-646, June-July 1975. 25 fig. 7 tab, 22 ref.

Descriptors: *Groundwater, *Percolating water, *Leaching, *Mineralogy, Groundwater movement, Geology, Rocks, Granites, Sedimentary rocks, Fissures(Geologic), waters. Adsorption. Spring waters, Adsorption, Deposi-tion(Sediments), Petrology. Identifiers: *Uranium, *Japan, Mineralization, Carbonaceous matter, Ores.

To solve the mechanism of uranium concentration in stratabound uranium deposits occurring in the basal part of Neogene sediments overlying granite basement, attention has been paid to uranium leaching from weathered granite by circulating carbonated fissure waters, to effective adsorbents for fixing uranium from uraniferous ground-waters, to structural features controlling the groundwater circulation, and to other relevant factors. The evidence for uranium transportation by hydrothermal solutions, including hot spring waters, was had to observe. It was concluded: (1) uranium in the deposits is supplied from surrounding source rocks, mostly from granite; (2) uranium is transported by circulating groundwater solu-tions; (3) the uranium dissolved in graoundwater is fixed in minerals in various ways, the most impor tant being adsorption by carbonaceous matter; (4) ore-grade uranium concentrated from very dilute solutions occurs by multiple repetition of a leaching-and-fixation cycle between minerals or adsorbents and circulation uraniferous ground-water; and (5) important factors for uranium mineralization are sufficient uranium (supplied mostly from granite), the existence of effective sorbents such as carbonaceous matter in the host rocks, and favorable geological, geochemical, and geophysical environments. The last seem to require not only physical and chemical conditions but also corrent flow and volume of groundwater. (Sims-ISWS) W75-11145

APPROXIMATION FOR STEADY INTERFACE BENEATH A WELL PUMPING FRESH WATER OVERLYING SALT WATER, New Mexico Inst. of Mining and Technology,

For primary bibliographic entry see Field 4B. W75-11255

GROUND WATER DEPLETION AND SUB-SIDENCE PROBLEMS IN TAIPEI BASIN, National Taiwan Univ., Taipei. Hydraulic Lab. For primary bibliographic entry see Field 4B. W75-11262

D ch Se R

ize

dli

In

ev

are nut

on Ma

tecl

SOL

Ariz

Eng

Univ

60 fi

Desc

Soil.

chem

Soil

2G. Water In Soils

BARRENNESS OF DESERT PAVEMENT IN YUMA COUNTY, ARIZONA, Arizona Univ., Tucson. H. B. Musick.

Journal of the Arizona Academy of Science, Vol 10, No 1, p 24-28, February, 1975. 2 fig, 2 tab, 20

Descriptors: *Arid lands, *Sierozems, *Soil analysis, *Soil texture, *Infiltration, Arid climates, Deserts, Semiarid climates, Remote sensing, Aerial photography, Shrubs, Soil investigation, Saline soils, Colloids, Flocculation, *Arizona.

Identifiers: *Desert pavement, Yuma County(Ariz)

Desert pavement, a common feature of many desert areas, is a nearly flat soil surface consisting of a single closely-packed layer of pebbles, generally covered with dark brown desert varnish, and devoid of vegetation. Analysis shows it is and devoid of vegetation. Analysis snows it usually saline-sodic or sodic. Deflocculation of soil colloids by exchangeable sodium results in low soil infiltration of rainfall and reduces soil moisture supply. The absence of soil moisture seems to be the most important factor preventing the establishment of plant life on the desert pave-ment soil. (Robinett-Arizona) W75-10868

SEASONAL VARIATIONS IN THE INFILTRA-TION RATE OF A WHITEHOUSE SOIL IN SOUTHERN ARIZONA, Arizona Univ., Tucson. Dept. of Watershed

J. G. Medina Torres.

Arizona University, Tucson, Department of Watershed Management, MS Thesis, 1974, 41 p, 9 fig, 6 tab, 1 append, 48 ref.

Descriptors: *Infiltration, *Infiltration rates, *Induced infiltration, *Watershed management, *Range management, *Arizona, Loam, Soil moisture, Rainfall simulators, Soils, Soil types, Soil density, Vegetation, Sands, Seasonal. Identifiers: *White-house sandy loam, Page-Trowbridge Experimental Ranch(Ariz).

An experiment to test the hypothesis that terminal infiltration rates for a White House sandy loam soil varied with the seasons of the year was un-dertaken at the Page-Trowbridge Experimental Ranch in southern Arizona. Infiltration rates were estimated during the winter, early spring, and early summer of 1974. Simulated rainfall was applied to plots one-thousandth of an acre in size by using the Rotadisk Rain-ulator. Antecedent soil moisture and soil bulk density were measured and vegetation growth stage recorded at the time of each infiltration run. Cover measurements were made at the last infiltration run of all plots. Nonsignificant differences influenced by the season of the year were found in the terminal infiltration rates. However, there was a consistent decrease of antecedent soil moisture from January to June. (McLeachlan-Arizona)

MANAGEMENT OF SOUTHWESTERN DESERT

Arizona Univ., Tucson. Dept. of Soils, Water and Engineering. W. H. Fuller.

University of Arizona Press, Tucson. 1975. 195 p, 59 fig, 28 tab.

Descriptors: *Sierozems, *Soil management, *Arid lands, *Soil-water-plant relationships, *Soil chemical properties, *Soil physical properties, Soil environment, Soil texture, Soil treatment, Rainfall, Soil aggregates, Flocculation, Wettability, Soil microorganisms, Soil amendments, Fertilizers, Organic matter, Soil analysis, Salinity, Soil structure, Soil compaction, Compacted soils, Pud-dling, Land reclamation, Soil water, Soil water movement, Soil stabilization.

In arid climates, soils are under stresses of irrigation water that is high in salt content, of a high evaporation rate from surfaces with concurrent upward movement of salts by capillary action, and of high water demand by plants to accommodate heavy transpiration losses under desert conditions. Southwestern desert soil profiles are explained, and the functions, composition, sources, management and maintenance of organic matter in soils are discussed. The need for and practical uses of nutrients and fertilizers are outlined with emphasis on individual chemical and physical properties. Management of arid lands including reclamation techniques, salinity control and water use is outlined. Soil and water conservation, both essential to arid soil management, are emphasized. Techniques for testing desert soil, water, and plants are presented. (Michael-Arizona) W75-10877

d

ny ng es, sh.

of

ure

ting

shed

SOILS OF THE DESERT SOUTHWEST,

Arizona Univ., Tucson. Dept. of Soils, Water and

University of Arizona Press, Tucson. 1975. 102 p. 60 fig. 6 tab.

Descriptors: *Southwest US, *Sierozems, *Arid lands, *Soils, *Soil classification, *Soil surfaces, *Soil investigations, *Soil physical properties, Soil chemical properties, Soil chemistry, Soil environment, Soil erosion, Soil formation, Soil horizons, Soil profiles, Soil properties, Soil structure, Soil texture, Soil types.

The characteristics of desert soils in the southwestern United States are contrasted and compared with soils for more humid climates. An overview is presented of the physical characteristics, vegetation, and human impact on desert soils. Physical makeup of desert soils, including mineral and organic matter and soil matter and air content is explained. The soil forming features of the desert (climate, vegetation, topography, parent material and time) are discussed individually and their interaction under certain conditions is elaborated. Topsoil appearance and subsurface structure are explained in relation to mineral content, weathering and the desert fauna which exist in the soil. The last chapter demonstrates how to classify soils into groups and the appendix gives soil classification and nutrient cycle charts. (Miller-Arizona) W75-10878

SOIL MORPHOLOGY AND SOIL PHYSICAL PROPERTIES: II. MECHANICAL IMPEDANCE AND MOISTURE RETENTION AND MOVE-MENT.

Saskatchewan Univ., Saskatoon. Dept. of Soil

K. W. Ayres, R. G. Button, and E. De Jong Canadian Journal of Soil Science, Vol 53, No 1, p 9-19, 1973. Illus.

Descriptors: *Soil physical properties, *Moisture content, Soil structure, Soil mechanics, Soil horizons, *Soil density, Chernozems, Porosity, Regression analysis, Hydraulic conductivity, Bulk

Identifiers: Solonetzic soils, *Soil mechanical im-

The relations among soil structure, soil mechanical impedance and moisture retention and movement were investigated on undisturbed soil cores from soil horizons exhibiting 6 distinct kinds of soil structure (prismatic, columnar, blocky, granular, platy, massive) over a broad range of soil texture. Mechanical impedance was characterized by mea-surements of bulk density and soil strength. Moisture retention and movement were characterized by measurements of 1/3-atm moisture content and saturated hydraulic conductivity. The columnar structures from Solonetzic soils were columnar structures from Solonetzic soils were singled out as having a higher mechanical im-pedance and lower hydraulic conductivity than the other structures, most of which were sampled from Chernozemic soils. Total porosity (P) and bulk density (Db) were highly correlated; how-ever, the regression coefficient for P vs. Db for columnar structures was significantly higher than that found for the other 5 structural types. Regression equations predicted that the hydraulic conductivity of platy structures could be zero for sam ples having as much as 15% air-filled pore space at 1/3-atm suction as compared with 6-8% for the other structures.--Copyright 1973, Biological Abstracts. Inc 75-10885

USE OF AMENDMENTS TO REDUCE WATER REQUIREMENTS FOR STAND ESTABLISH-MENT OF SMALL-SEEDED CROPS,

Arizona Univ., Tucson. Dept. of Plant Sciences. For primary bibliographic entry see Field 3F. W75-11045

MOISTURE AND ENERGY CONDITIONS IN A

DRAINING SOIL MASS, Georgia Univ., Athens. School of Forest

W. L. Nutter

Available from the National Technical Informa Tools from the National Technical Information Service, Springfield, Va. 22161, as PB-244 726, \$4.75 in paper copy, \$2.25 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No ERC-0875, June 1975, 88 p, 15 fig, 4 tab, 26 ref. OWRT A-025-GA(2), 14-31-0001-3510. Descriptors: Watersheds(Basins),
watersheds, *Recession curves, Subsurface drainage, *Soil water movement, Percolation, Soil properties, Subsurface flow, Unsaturated Flow, Tensiometers, *Subsurface runoff, Model studies, Slopes, Soil moisture, Moisture content, Energy,

Identifiers: *Hillside drainage, Matric potential, Soil mass

A 6.1 m long, 1.2 m deep and 0.3 m wide soil model was constructed in the laboratory. The model may be mechanically raised from the horizontal to a 27-degree angle. The model was packed with a mixed subsurface horizon soil composed of 51 percent sand, 21 percent silt and 28 percent clay. The objective was to study the effects of slope angle and soil depth on the moisture and energy conditions within a draining soil mass and their relationship to streamflow depletion. Three slopes (25, 15, and 5 degrees) were drained at three depths (120, 80 and 40 cm), a total of nine drainage sequences. As drainage continues the equipotential lines of hydraulic head approach a position normal to the surface. The degree of divergence from normal increases with decrease in slope angle. Water content gradients suggest that a zone of active water movement migrates downslope during drainage and may migrate back upslope during the input of rainfall. The zone may identify the limits of source areas during stormflow. Of the variables studied, slope angle exerts the greatest influence over the nature of drainage from a soil mass. Response of a moderately step and moderately deep slope will be similar to that of a steep and deep slope. W75-11054

LIMITATIONS OF USING A SIMULATION MODEL OF THE SOIL UNDER IRRIGATED CULTIVATION TO SIMULATE THE FUNCTIONING OF THE SOIL AS A PURIFYING SYSTEM (LIMITES D'UTILISATION D'UN MODELE DE COMPORTEMENT DU SOL SOUS CULTURE IRRIGUEE POUR SIMULER LE FONCTIONNMENT DU SOL COMME SYSTEME EPURATEUR),

Institut National de la Recherche Agronomique, Versailles (France). Soils Lab. For primary bibliographic entry see Field 5B.

W75-11125

THE USE OF SOIL AS A PURIFYING SYSTEM (L'UTILISATION DU SOL COMME SYSTEME

EPURATEUR), Institut National de la Recherche Agronomique, Dijon (France). Laboratoire de Microbiologie des

For primary bibliographic entry see Field 5D. W75-11126

SOIL MAP OF THE WORLD, 1:5,000,000, VOLUME IV, SOUTH AMERICA.

Food and Agricultural Organization of the United Nations, Rome (Italy); and United Nations Educa-tional, Scientific, and Cultural Organization, Paris

For primary bibliographic entry see Field 7C. W75-11138

AVAILABLE WATER-HOLDING CAPACITIES OF SOILS IN SOUTHERN IDAHO.

Idaho Agricultural Experiment Station, Aberdeen, R. E. McDole, G. M. McMaster, and D. C. Larsen. Current Information Series No 236, June 1974, 4 p.

Descriptors: *Soil moisture, *Available water, *Retention, *Idaho, Root zone, Soil-water-plant retention, 'Idano, Root zone, Soil-water-plant relationships, Wilting point, Moisture content, Field capacity, Subsurface waters, Soils, Soil physical properties, Soil water, Soil texture, Soil types, Laboratory tests, Infiltration, Agriculture. Identifiers: "Available water-holding capacities.

Field 2-WATER CYCLE

Group 2G-Water In Soils

To manage moisture on agricultural cropland, one must know how much water and soil profile can hold and store for plant use. This is called the available water-holding capacity of the soil and is usually expressed as inches of water per foot of soil depth. The available water-holding capacity of any soil can be calculated from: (1) the thickness of the horizons that make up the soil profile, and (2) the moisture characteristics of these horizons. The first of these - the kind, arrangement and thickness of soil horizons - can be determined by examining the soil profile. The second factor, the moisture characteristics of these horizons, can be determined by laboratory analyses. Laboratory studies that determined water-holding capacities of specific soils (soil series) and soil texture classes in southern Idaho were reported. Samples for this study were collected from agricultural areas across southern Idaho. Each of the samples was analyzed in laboratory pressure chambers to determine water-holding capacity values. A method called ceramic plate extraction was used to establish a desorption curve for each sample. These curves were the basis for determining the permanent wilting point and field capacity. These values, in turn, were used to calculate available water-holding capacity for each soil. (Sims-ISWS) W75-11140

CHANGES IN VEGETATION AND SURFACE SOIL PROPERTIES FOLLOWING IRRIGATION OF WOODLANDS WITH MUNICIPAL WASTE-Michigan State Univ., East Lansing. Dept. of

Forestry. For primary bibliographic entry see Field 5B W75-11243

2H. Lakes

EPIFAUNAL INVERTEBRATES AS INDICA-TORS OF WATER QUALITY IN SOUTHERN LAKE PONTCHARTAIN,

New Orleans Univ., La. Dept. of Biological Sciences.

For primary bibliographic entry see Field 5C. W75-10853

LIMNOLOGY OF DESERT PONDS,

Arizona Univ., Tucson. Dept. of Biological S. R. Alcorn

Arizona University, Tucson, Department of Biological Sciences, MS Thesis, 1974. 45 p, 3 fig, 6 tab, 31 ref. 2 append.

Descriptors: *Limnology, *Ponds, *Fisheries, "Warm-water fish, "Arizona, Water properties, Sampling, Water sampling, Data collections, Water analysis, Water temperature, Dissolved oxygen, Hydrogen ion concentration, Aq plants, Euphotic zone, Thermal stratification. Identifiers: Photic zone. Aquatic

The limnology of five types of ponds in Southern Arizona was studied from October 1972 to September 1973 to provide information for the use of ponds as fisheries. Temperature, oxygen, pH, and photic zone measurements were made monthly. Diel studies of temperature, oxygen, and pH were conducted in July. Weather conditions caused thermal stratification to begin in February and last through October in deeper ponds. Complete nightly summer circulation occurred in most ponds. Shaded ponds were no cooler than open ponds. Winter oxygen concentrations were above mg/l in all ponds. Winter oxygen concentrations were suitable for warm-water fish year round and trout from November through April. The best type of ponds were those filled with well water rather than those supplied by runoff. (McLachlan-Arizona) W75-10880

SOME LIMNOLOGICAL CHARACTERISTICS OF ARIVACA LAKE IN SOUTHERN ARIZONA,

Arizona Univ., Tucson. J. C. Tash, and C. D. Ziebell. Journal of the Arizona Academy of Science, Vol 10, No 1, p 8-14, February 1975. 4 fig. 3 tab, 11 ref.

Descriptors: "Arizona, "Limnology, "Aquatic en-vironment, "Sport fishing, "Lake fisheries, "Artificial lakes, Lakes, Water temperature, Dis-solved oxygen, Light penetration, Benthos, Aquatic microorganisms, Zooplankton, Aquatic life, Water, sempling, Operatic parter, Eich, Eich life, Water sampling, Organic matter, Fish, Fish management. Identifiers: *Arivaca Lake(Ariz).

Scarcity of water in Southern Arizona gives premium value to all waters that provide aquatic-related recreation. Larger lakes, all of which are manmade, receive particularly heavy recreational use primarily in the form of sport fishing. Value and use of these lakes for sport fishing are directly related to the quality and productivity of the water. Data are presented on temperature, dissolved oxygen, zooplankton, and benthos for Arivaca Lake, the most recently constructed of four large manmade lakes. These data can be used for future studies that will improve management of fisheries in other Southern Arizona lakes. (Robinett-Arizona) W75-10891

TWO-DIMENSIONAL, HYDROSTATIC SIMU-LATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS,

Stanford Univ., Calif. Dept. of Civil Engineering. B. R. Roberts, and R. L. Street.

Available from the National Technical Informa tion Service, Springfield, Va 22161 as PB-244 535, S6.25, in paper copy, \$2.25 in microfiche. Technical Report No. 194, July 1975. 162 p, 32 fig, 6 tab, 32 ref, 2 append. OWRT C-3033(No 3675)(1).

*Thermal pollution, *Thermal Programs, *Lakes, stratification. *Computer models, *Reservoirs, Numerical analysis, Digital computers, Simulation analysis, Currents(Water), Circulation, Thermocline, Equations, Model studies

The study led to a simplified and two-dimensional, numerical model capable of representing stratifi-cation and thermally unstable flows in lakes. The Navier-Stokes equations, a heat balance equation, the continuity equation, and an equation relating fluid density to temperature are combined to form a closed system. The Boussinesq approximation is used; a hydrostatic pressure distribution is assumed. A sub-grid-scale turbulence model pro-vides a variable eddy viscosity for diffusion calcu-lations. The numerical model follows a Markerand-Cell-style format in variable placement, up-stream differencing was used for convection terms, and FORTRAN is the program language. The model was implemented for use on an IBM 370/168. Favorable comparisons with other models were obtained. A long-term, large-scale stratification process was simulated and quantitative agreement with laboratory experiments was obtained. W75-10901

CONCURRENT NITRIFICATION-DENITRIFICATION AT THE SEDIMENT-WATER INTER-FACE AS A MECHANISM FOR NITROGEN LOSSES FROM LAKES,

Wisconsin Univ., Madison. Dept. of Soil Science. For primary bibliographic entry see Field 5C W75-10902

COMPUTER PROGRAM PACKAGE FOR AQUATIC ECOLOGISTS.

Cornell Univ., Ithaca, N.Y P. J. Godfrey, L. White, and E. Keokosky. Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 508, \$4.25 in paper copy, \$2.25 in microfiche. Technical Report 95, Cornell University Water Resources and Marine Sciences Center, Ithaca, New York, April 1975. 48 p, 2 fig, 1 tab, 4 ref, 1 append. OWRT A-047-NY(2) and B-038-NY(2).

Descriptors: *Aquatic life, *Ecology, *Computer programs, *Data collections, Computers, Lakes, Water quality, Depth, Phytoplankton, Tempera-ture, Water chemistry, Biological properties, Car-bon dioxide, Dissolved oxygen. Identifiers: Data reduction, Pigment ratios

Aquatic ecology frequently requires the collection of large amounts of field data. These data can be condensed into a manageable and meaningful form using a computer. Several computer programs developed to meet the specialized needs of data common to aquatic ecology are presented. These programs are useful for data reduction and arrangement, and several have been designed to produce output for subsequent use in available statistical program packages. They are flexible and basically simple, thus having wide applicability and appeal to the computer novice. The programs are classified into three groups: (1) generalized programs applicable to many forms of limnological data -- INTEGRATE, and AVERAGE; (2) specialized programs for chemical data--CO2 and D.O. SAT, and PIGMENT RATIO; and (3) specialized programs for biological data-SPECIES, and SUC-CESSION. The programs are written in Fortran IV, except for SPECIES which is written in PL/I. All have been run on an IBM 360 and IBM 370, but conversion to other systems should not be difficult. The programs are described in detail, and an appendix includes program listings and examples of the outputs. (Bell-Cornell) W75-10908

A SIMPLE AND INEXPENSIVE TECHNIQUE FOR DETERMINING COLORED LIGHT IN-TENSITY UNDERWATER, Genesee Community Coll., Batavia, N.Y. Mathe-

matics and Science Div For primary bibliographic entry see Field 7B. W75-10919

WIND EFFECTS ON CHEMICAL FILMS FOR EVAPORATION SUPPRESSION AT LAKE

Oklahoma State Univ., Stillwater, Dept. of Agricultural Engineering.

For primary bibliographic entry see Field 3B. W75-10920

THE GEOCHEMICAL CYCLE OF ARSENIC IN LAKE WASHINGTON AND ITS RELATION TO OTHER ELEMENTS.

Washington Univ., Seattle. Dept. of Oceanography. For primary bibliographic entry see Field 5B W75-10922

ROOT:SHOOT AND LEAF AREA RELATION-SHIPS OF MACROPHYTE COMMUNITIES IN CHAUTAUQUA LAKE, NEW YORK, State Univ. Coll., Fredonia, N.Y. Dept. of Biolo-

For primary bibliographic entry see Field 5C. W75-11009

UTILIZATION STREAM-BORNE PHOSPHORUS BY CAYUGA LAKE PHYTOPLANKTON,

New York State Coll. of Agriculture and Life Sciences, Ithaca, N.Y. Ecology and Systematics

For primary bibliographic entry see Field 5C W75-11036

PRELIMINARY INVESTIGATIONS COPPER CYCLING IN INDIAN LAKE, MAS-

SACHUSETTS: A LAKE TREATED ANNUALLY WITH COPPER SULFATE, Massachusetts Univ., Amherst. Water Resources

Research Center.
For primary bibliographic entry see Field 5B.

W75-11039

HYDRAULIC MODELING OF MIXING PHENOMENA IN STRATIFIED LAKES, Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering. P. M. Moretti, and D. K. McLaughlin.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 725, \$3.75 in paper copy, \$2.25 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, 1975. 33 p, 16 fig, 1 tab, 11 ref. OWRT A-050-OKLA(3).

Descriptors: *Lakes, *Mixing, *Dispersion, *Stratification, *Hydraulic models, *Stratified flow, Density stratification, Flow characteristics, Model studies, *Oklahoma.

Identifiers: Richardson number, Vertical dispersion, Horizontal dispersion, Ham's Lake(Okla).

The objective was to provide criteria for laboratory modeling of stratified lake flows. Consideration was given to fluid inflows and to flows generated by a mechanical destratification device. The inflow experiments were designed to investigate the effects of scale distortion since vertical scale exaggeration is necessary in laboratory size models, to offset the increased viscous forces that accompany the size reduction. Experiments were per-formed in two inflow lake models which are identical in horizontal dimensions but differ by a factor of two in the vertical dimensions. Density profiles and dye front flow visualization records were made of inflows over a range of flow parameters. It was established that a vertically exaggerated model of a stratified lake flow cannot replicate all the details of the mixing process. However, verti-cal dispersion alone can be accurately modeled in a distorted model of an inflow in a stratified basin if the overall Richardson number is used as the modeling parameter. Similarly horizontal dispersion can be accurately modeled if a modification of Richardson number is used as the basic model ing parameter. A vertically exaggerated model of Ham's lake was constructed and experiments were made of the mechanical destratification of the model. Surprisingly accurate modeling of the prototype destratification experiments was achieved with the model. The appropriate non-dimensional parameter is the overall Richardson number and the characteristic time used to non dimensionalize the mixing times was the volume of the lake divided by the volume flow rate of the pump. W75-11043

BIOCHROME ANALYSIS AS A METHOD FOR ASSESSING PHYTOPLANKTON DYNAMICS,

Arkansas Univ., Fayetteville. Dept. of Botany and Bacteriology

For primary bibliographic entry see Field 5C. W75-11052

SOME RESULTS ON MASS TRANSFER PROCESSES IN A DENSITY-STRATIFIED FLOW.

Mississippi Univ., University. Dept. of Mechani-

cal Engineering.
For primary bibliographic entry see Field 8B.
W75-11057

SOUTH AFRICAN EU' PROBLEMS: A PERSPECTIVE, EUTROPHICATION

National Inst. for Water Research, Pretoria (South Africa)

For primary bibliographic entry see Field 5C. W75-11131

DISSOLVED ORGANIC MATTER AND LAKE METABOLISM, Michigan State Univ., Hickory Corners. W. K.

Kellogg Biological Station.
For primary bibliographic entry see Field 5C.
W75-11188

INVESTIGATION OF THE INFLUENCE OF THERMAL DISCHARGE FROM A LARGE ELECTRIC POWER STATION ON THE TEM-PERATURE AND NEAR-SHORE CIRCULA-TION OF LAKE MICHIGAN,

Wisconsin Univ., Milwaukee. Center for Great

Lakes Studies. For primary bibliographic entry see Field 5C. W75-11190

AQUATIC PLANT CONTROL ON LAKE COR-PUS CHRISTI,

Army Engineer District, Galveston, Tex For primary bibliographic entry see Field 5G. W75-11194

PRIMARY PRODUCTION IN LAKES ONTARIO AND ERIE: A COMPARATIVE STUDY, Canada Centre for Inland Waters, Burlington

(Ontario).

For primary bibliographic entry see Field 5C. W75-11217

MICROBIOLOGICAL EXAMINATION OFFSHORE LAKE ERIE SEDIMENTS. Canada Centre for Inland Waters, Burlington (Ontario)

For primary bibliographic entry see Field 5C. W75-11218

APPLICATION OF THE MANOMETRIC TECHNIQUE IN THE STUDY OF SEDIMENT

OXYGEN DEPLETION, Canada Centre for Inland Waters, Burlington (Ontario).

For primary bibliographic entry see Field 5C. W75-11222

THE EFFECTS OF THE FORMATION OF LAKE KAINJI (NIGERIA) UPON THE INDIGENOUS FISH POPULATION,

Ife Univ. (Nigeria). Kainji Dam Research Project. For primary bibliographic entry see Field 5C. W75-11223

ACID STRIP MINE LAKE RECOVERY, Missouri Univ., Columbia. Dept. of Civil Engineering. For primary bibliographic entry see Field 5C. W75-11224

THE GROWTH OF SOME EPIPHYTIC ALGAE IN A LAKE RECEIVING THERMAL EFFLUENT,

Alberta Univ., Edmonton. Dept. of Botany For primary bibliographic entry see Field 5C. W75-11225

IN SITU MEASUREMENT OF THE SETTLING VELOCITY PROFILE OF PARTICULATE OR-GANIC CARBON IN LAKE ONTARIO, Canada Centre for Inland Waters, Burlington

(Ontario). For primary bibliographic entry see Field 5C. W75-11227

A GENERAL DESCRIPTION OLIGOTROPHIC LAKE OF THE OLIGOTROPHIC LAKE PAAJARVI, SOUTHERN FINLAND, AND THE ECOLOGI-

CAL STUDIES ON IT, Helsinki Univ. (Finland). Dept. of Botany. For primary bibliographic entry see Field 5C.

W75-11229

MAN'S IMPACT ON A NEWLY FORMED

RESERVOIR, New Mexico Univ., Albuquerque, Dept. of Biolo-

gy. For primary bibliographic entry see Field 5C.

EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. IV.
FEEDING OF INTRODUCED AND AUTOCHTHONOUS NON-PREDATORY FISH,
Warsaw Univ. (Poland). Dept. of Hydrobiology. For primary bibliographic entry see Field 5C W75-11234

A CONTRIBUTION TO THE BIOLOGY OF NITELLA HOOKERI A. BR. IN THE ROTORUA LAKES, NEW ZEALAND. II. ORGANIC NUTRIENTS AND PHYSICAL FACTORS, Auckland Univ. (New Zealand). Dept. of Botany. For primary bibliographic entry see Field 5C. W75-11235

SEDIMENT PROCESSES IN GREAT LAKES, Canada Centre for Inland Waters, Burlington For primary bibliographic entry see Field 2J. W75-11237

SEASONAL ABUNDANCE OF CRUSTACEAN ZOOPLANKTON AND NET PLANKTON BIOMASS OF LAKES HURON, ERIE, AND ON-TARIO, Canada Centre for Inland Waters, Burlington

(Ontario).

For primary bibliographic entry see Field 5C. W75-11238

W75-11239

W75-11240

THE UTILIZATION OF SUN-GLINT IN A STUDY OF LAKE DYNAMICS,
Canada Centre for Inland Waters, Burlington(Ontario). For primary bibliographic entry see Field 5A.

PRELIMINARY INFORMATION ON THE NATURE OF ORGANIC MATTER IN THE SUR-FACE SEDIMENTS OF LAKES HURON, ERIE, AND ONTARIO.

Canada Centre for Inland Waters, Burlington (Ontario) For primary bibliographic entry see Field 2J.

QUANTITATIVE ESTIMATION OF THE DAILY INGESTION OF PHYTOPLANKTON BY TILAPIA NILOTICA AND HAPLOCHROMIS NIGRIPINNIS IN LAKE GEORGE, UGANDA, Queensland Univ., Brisbane (Australia). Dept. of Zoology. C. M. Moriarty, and D. W. J. Moriarty

J Zool Proc Zool Soc Lond, Vol 171, No 1, p 15-23, 1973, Illus.

Descriptors: *Phytoplankton, Lakes, *Digestion, Herbivores, *Fish, Africa. Identifiers: *Haplochromis-nigripinnis, *Tilapia-

nilotica, *Uganda(Lake George).

A direct method was used to estimate the amount of phytoplankton ingested per day by herbivorous fish in Lake George, Uganda. The quantities in-gested are linearly related to the weight of the fish, as given by the following regression equations: for Tilapia milotica: y = 271 + 13.3 x and for Haplochromis nigripinnis: y = -29.6 + 21.9 x, where y is the dry weight of photoplankton (mg) ingested per day and x is the wet weight of the fish (g).—Copyright 1974, Biological Abstracts, Inc.

Field 2-WATER CYCLE

Group 2H-Lakes

W75-11268

THE MEASUREMENT AND ESTIMATION OF LAKE EVAPORATION FROM FOUR AUSTRALIAN WATER STORAGES,

Bureau of Meteorology, Melbourne (Australia). For primary bibliographic entry see Field 2D. W75-11300

SEASONAL ABUNDANCE AND DIVERSITY OF BENTHOS IN A SOUTHERN ILLINOIS, USA

SWAMP, Central Michigan Univ., Mt. Pleasant. Dept. of

Biology. J. N. Krull, and W. A. Hubert. Nat Hist Misc. 190. p 1-4, 1973

Descriptors: *Benthos, *Illinois, Seasonal, Invertebrates, *Swamps, *Benthic fauna, Organic matter, Oxygen, Environmental effects, *Aestivation, Summer, Wetlands. Identifiers: *Pine Hill Swamp(III).

The benthic invertebrate fauna of a portion of the Pine Hills Swamp (Illinois, USA) exhibited ex-treme seasonal fluctuations in both abundance and diversity. The dominant benthos was characterized by organisms tolerant of high concentrations of organic material and low O2 levels, as well as possessing aestivation capabilities or life cycle adaptations to overcome severe midsummer environmental conditions .-- Copyright 1974, Biological Abstracts, Inc.

2I. Water In Plants

PHENOLOGY OF SELECTED DESERT PLANTS AT PUNTA CIRIO, SONORA, MEXICO.

Arizona Univ., Tucson. Dept. of Biological

R. R. Humphrey.

Journal of the Arizona Academy of Science, Vol 10, No 1, p 50-67, February, 1975. 1 fig, 2 tab, 7

Descriptors: "Phenology, "Mexico, "Plant growth,
"Arid climates, "Soil-water-plant relationships,
"Desert plants, Biorhythms, Environmental effects, Growth stages, Precipitation(Atmospheric),
Seasonal, Climatic data, Weather data, Shrubs,
Semiarid climates, Soil moisture, Flowering,
Vegetation, Cacti, Arid lands.
Identifers: Punta Cirio(Mexico), Sonora(Mexico),
Identifers: Punta Cirio(Mexico), Sonora(Mexico).

Identifiers: Punta Cirio(Mexico), Sonora(Mexico), Baja California(Mexico).

Phenological changes observed at Punta Cirio within an approximate 50 meter radius and no more than 100 meters from the Gulf of California coast were evaluated. Seasonal patterns are evident, particularly with respect to certain taxa, but the important controlling factor may be available moisture rather than temperature or other seasonal variables. Most of the vegetation is comprised of various shrubs, half-shrubs and cacti. Phenological data are presented for 20 Sonoran Desert species. (Robinett-Arizona) W75-10862

THE EARLY VEGETATIVE GROWTH OF TWO ANNUAL PASTURE GRASSES (HORDEUM LEPORINUM LINK AND LOLIUM RIGIDUM GAUD.).

South Australia Dept. of Agriculture, Adelaide. For primary bibliographic entry see Field 3F. W75-10876

ESTABLISHING ALKALI SACATON ON HARSH SITES IN THE SOUTHWEST, Forest Service, (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station. For primary bibliographic entry see Field 4A. W75-10882

PRODUCTS FROM JOJOBA: A PROMISING NEW CROP FOR ARID LANDS. National Research Council, Washington, D.C. Committee on Jojoba Utilization. For primary bibliographic entry see Field 3F.

W75-10890

THE GERMINATION AND ESTABLISHMENT OF TWO ANNUAL PASTURE GRASSES (HORDEUM LEPORINUM LINK AND LOLIUM RIGIDUM GAUD.),

South Australia Dept. of Agriculture, Adelaide. P. S. Cocks, and C. M. Donald.

Australian Journal of Agricultural Research, Vol 24, No 1, p 1-10, January 1973. 1 fig, 7 tab, 9 ref.

rs: *Soil-water-plant relationships, *Germination, *Seeds, *Plant growth, Descriptors: *Grasses, *Germination, *Seeds, *Plant growth, Soaking, Wetting, Drying, Soil surfaces, Loam, Vegetation establishment, Soil water, Absorption, Water injury, Grasslands, Pastures, Osmotic pres sure, Moisture stress, Plant physiology, Seed treatment.

Identifiers: Hordeum leporinum Link, Lolium regidum Gaud.

Studies under controlled conditions show that Hordeum leporinum Link germinates more quickly than Lolium rigidum Gaud. at all temperatures. Lolium requires alternating temperatures for maximum germination: Hordeum shows little response to temperature variation. Germination of both species is depressed at temperatures above 30C and inhibited at 36C and above. Soaking Hordeum seeds for 10 hours and Lolium for 18, then drying and rewetting seeds stimulates germination of both species. Longer soaking depresses germination rates. Controlled experiments on soil sur-face show Hordeum better able to germinate with small amounts of water. Absorption studies indicate water uptake of seeds is identical for both species. Hordeum was able to germinate in soluons of higher osmotic pressure than was Lolium. (Michael-Arizona) W75-10897

ENVIRONMENTAL IMPACT EVALUATION IN FRESHWATER IMPOUNDMENTS BY VEGETATION ANALYSIS OF THE TER-RESTRIAL ECOSYSTEM,

Massachusetts Univ., Amherst. Water Resources

earch Center. P. W. Fairbairn, and C. A. Carlozzi.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 505, \$6.25 in paper copy, \$2.25 in microfiche. Publication No. 49, Completion Report FY-75-4, April 1975. 141 p, 22 tab, 37 fig. 18 append, 27 ref. OWRT A-053-MASS(1). 14-31-0001-4021.

Descriptors: Evaluation, *Environmental effects. Vegetation, *Ecosystems, *Ecology, Rivers, Floods, *Floodwater, Management, Impound-ments, *Vegetation effects, *Massachusetts,

The objective was to develop and test a method of analyzing the ecological impact of artificially im-pounded floodwaters on the terrestrial environment. The approach was to apply techniques of field ecology to three similar river systems each subject to a different management regimen, with a view to determining levels of relative community stability in terms of successional maturity. Degree of environmental impact was described in terms of vegetative characteristics correlated with eleva-tion, including life form, species dominance, diversity indices, biomass, seasonal distribution of flowering, method of seed dispersal, and number of exotics and annuals present. Emphasis was on community rather than single-species attributes. These characteristics were correlated negatively or positively in a consistent fashion with degree of

flooding intensity. A composite graph was drawn up displaying in an additive way nine vegetative characteristics. By this means it was possible to show the cumulative impact of flooding across a vertical range of 60 feet. On the strength of the characteristics used it was considered possible to define the relative levels of community stability at each of the three rivers studied, at different levels of flooding stress. W75-10905

EFFECT OF SOIL-WATER RELATIONS ON THE ROOT POROSITY, TRANSPIRATION AND ION UPTAKE IN RICE.

Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Dept. of Soil Science.

For primary bibliographic entry see Field 3F. W75-10916

SPECIES DIVERSITY OF BENTHIC MACROIN-VERTEBRATES AND LIMNOLOGICAL CON-DITIONS IN A 1ST ORDER MOUNTAIN STREAM.

Bradley Univ., Peoria, Ill. Dept. of Biology. B. J. Mathis.

Trans Ill State Acad Sci, Vol 66, No 3/4, p 29-32, 1973. Illus

Descriptors: *Invertebrates, *Benthos, Streams,

Identifiers: Limnological studies, *Moustreams, *Species diversity, Sphagnum bogs. *Mountain

Limnological conditions and species diversity were determined in a 1st order spring-fed mounwere determined in a 1st order spring-fed mountain stream flowing through a sphagnum bog. Aquatic invertebrates (36 spp.) representing 7 orders were collected during the study. Species diversity, and redundancy were similar to 4th order downstream stations.—Copyright 1974, Philosogical Abstracts Legislacing 1984. Biological Abstracts, Inc. W75-10918

SEASONAL VARIATION IN COMPOSITION, PLANT BIOMASS, AND NET PRIMARY PRODUCTIVITY OF A TROPICAL GRASS-LAND AT KURUKSHETRA, INDIA,

Kurukshetra Univ. (India). Dept. of Botany. J. S. Singh, and P. S. Yadava. Ecol Monogr. Vol 44, No 3, p 351-376, 1974, Illus.

Descriptors: *Seasonal, *Primary productivity, *Biomass, *Grasslands, Vegetation, Distribution, Water pollution effects. Identifiers: *India(Kurukshetra), *Tropical grass-

The variation in composition, plant biomass and net primary productivity was analyzed in a tropical grassland situated within the campus of the Kurukshetra University, India, at 29 deg 58' N latitude and 76 deg 51' E longitude. A study of life latitude and 70 deg 31 Et inigitude. 3 study 37 forms indicated a therocryptophytic flora. Detailed phytosociological values of constituent species of the vegetation were studied at monthly intervals (May 1970-May 1971) through tiller analvsis. Most of the species were found to be contagiously distributed. The changes throughout the year in the aboveground plant biomass, standing dead, litter, and belowground biomass showed a maximum aboveground biomass in Sept. (1974 g/sq m) and maximum belowground biomass in Nov. (1167 g/sq m). Examination of vertical distribution of the aboveground biomass of total vegetation as well as of the individual species indicated that different layers of vegetation are dominated by different species in different months. The aboveground net primary production was maximum during the rainy season (1706 g/sq m), and the belowground maximum occurred during the winter season (785 g/sq m). Total annual net primary production is estimated to be 3538 g/sq m. The system transfer functions revealed that productivity was more aboveground-directed during the wet period and more belowground-directed during the dry period. Annual efficiency of energy capture by the primary producers was calculated to be 1.66% on the basis of half total incident solar radiation .-- Copyright 1974, Biological Abstracts, W75-11006

VEGETATION, SOIL, AND CLIMATE ON THE GREEN MOUNTAINS OF VERMONT, Yale Univ., New Haven, Conn. School of

Forestry.

T. G. Siccama.

Ecol Monogr, Vol 44, No 3, p 325-349, 1974. Illus.

Descriptors: *Vermont, Climates, *Vegetation, Soils, *Beech, *Maple, *Forests, *Soil moisture, Trees.

Identifiers: *Green Mountains(Vt), Forest(Vt).

The Appalachian extension of the Boreal Forest, dominated by balsam fir, red spruce and white birch, extends down the slope of the Green Mountains to about 2600 ft (792 m), where it merges with the Eastern Deciduous Forest dominated by sugar manle, beech and vellow birch. These 2 forest formations occur well-developed horizontal bands on the mountains, with a distinctive tension zone forest between them. In this midslope forest, the species of neither the deciduous nor boreal forest are able to form well-developed long-lived stands. The contact between the deciduous and boreal forest is climatically, not edaphically, controlled. The current vegetation and soil development is the result of the long-term effects of a vertical climatic discontinuity expressed as a nonlinear decline in the length of the forest-free period across the midslope transitional forest and as a marked increase in the frequency of the cloud base at and above ca. 792 m. This results in increased moisture from fog drip and frequent occurrence of hoar frost in winter. The sharp decrease in the length of the growing season, together with marked changes in icing and atmospheric moisture conditions, limits the upward extension of the beech-maple forest.— Copyright 1974, Biological Abstracts, Inc. W75-11021

STUDIES ON THE RELATIONSHIP BETWEEN DRY-MATTER PRODUCTION AND THE DEVELOPMENT OF A PINE FOREST ON COASTAL SAND DUNES (1), (IN JAPANESE), Tottori Univ. (Japan). Dept. of Forestry Manage-

For primary bibliographic entry see Field 4A. W75-11098

A SURVEY OF FISHES AND COMMERCIAL INVERTEBRATES OF THE NEARSHORE AND ESTUARINE ZONE BETWEEN CAPE ROMANO

AND CAPE SABLE, FLORIDA, National Marine Fisheries Service, Panama City, Fla. Gulf Coastal Fisheries Center.

W. N. Lindall, J. R. Hall, W. A. Fable, and L. A. Available from the National Technical Informa-

tion Service, Springfield, Va 22161 as PB-235 215, \$4.25 in paper copy, \$2.25 in microfiche. South Florida Environmental Project, Ecological Report No DI-SFEP-74-44, July 1973. 66 p, 8 fig, 2 tab, 26

Descriptors: *Florida, *Marine fish, *Fisheries, *Neritic, *Estuaries, Gulf of Mexico, Baseline studies, Deep water, Shallow water, Distribution, studies, Dec. Coral, Surveys. *Cape

Romano(Fla). *Cape Sable(Fla), Sponges.

nearshore and estuarine of waters southwestern Florida, particularly Florida Bay and adjacent areas, provide feeding and nursery grounds for the young of many species of fish and shellfish. The multimillion dollar pink shrimp fishery of the Sanibel and Tortugas grounds is an outstanding example of production derived from this zone. Until comparatively recently the fish this zone. Until comparatively receiving the lists fauna of this region were poorly known. Baseline data were compiled on fishes inhabiting the estuarine and nearshore waters between Cape Romano and Cape Sable. Increasing conflicts of interest between the forces of conservation and those of development point to the immediate need for comprehensive evaluation of this area. Fish and commercial invertebrates taken at each station are tabulated. Nearly 32,000 finfish representing 114 species were collected. Fifty-five species were of commercial value and 24 of sport value. Over 2800 individuals of six species of commercial invertebrates were collected. Nomenclature and sequence of fishes are given in the annotated list. Environmental data where each species was collected are summarized. Salinity, water temperature or range, water depth or range, and bottom type or range are given. Sponges and hard or soft corals were also noted. (Jones-Wisconsin)

THE AQUATIC WEED PROBLEM, 1. IDENTIFI-

CATION, Victoria State Coll., Carlton (Australia). Dept. of Plant Physiology.

New Zealand Journal of Agriculture, Vol 129, No 2, p 40, 41, 43, 45, 1974. 5 fig.

Descriptors: *Aquatic weeds, *Aquatic plants, *Varieties, Plant groupings, Floating plants, Rooted aquatic plants, Submerged plants, Water hyacinth, Pondweed, Foreign countries, Drainage

Identifiers: *New Zealand, Duckweed, Water ferns, Azolla rubra, Azolla pinnata, Salvinia herzogii, Lemna minor, Wolffia arrhize, Spirodela oligorhhiza, Elodea canadensis, Lagarosiphon major, Egeria densa.

Of 34 aquatic weed species which cause problems in New Zealand, 29 are importations. Three broad groups consist of free-floating, submergent, and emergent species. The free-floating weeds are water ferns (Azolla and Salvinia), duckweeds, and water hyacinth. Two Azolla species can be identified by their roots: Azolla rubra roots hang straight down and are unbranched; Azolla pinnata roots branch and have fine hairs. Azolla rubra develops a deep red-brown color. The leaves of Azolla pinnata are more pointed. They reproduce rapidly so are difficult to eradicate. Salvinia heraciii. zogii is a brownish-green plant with folded hairy leaves. Three species of duckweed are found Lemna minor has only one root per green frond. Spirodela oligorhhiza has two or more roots. Wolffia arrhiza var. Australiana (water-meal) has no roots. Eradication is almost impossible. Water hyacinth, Eichhornia crassipes, is hard to eradicate because the seeds are long-lived. Three members of the submerged groups are Elodea canadensis (Canadian pondweed), Lagarosiphon major (oxygen weed), and Egeria densa (egeria). Elodea leaves occur in threes, egeria in fours and fives, and those of Lagarosiphon are alternate. (Buchanan-Davidson--Wisconsin) W75-11220

THE ROLE OF ENDOGENOUS ABSCISIC ACID IN THE RESPONSE OF PLANTS TO STRESS, Royal Univ. of Malta, Valletta. Dept. of Chemis-

For primary bibliographic entry see Field 3F. W75-11319

2J. Erosion and Sedimentation

MEASUREMENT OF COBBLE ABRASION IN NATURAL STREAMS,

Arizona Univ., Tucson. Dept. of Hydrology and Water Resources. F R Carlson

Arizona University, Tucson, Department of Hydrology and Water Resources, MS Thesis, 1974. 64 p, 12 fig, 6 tab, 25 ref, append.

Descriptors: *Abrasion, *Bed load, *Stream ero-sion, *Sediments, *Arizona, Weathering, Bedrock, Friction, Model studies, Streamflow, Particle size, Mathematical models, Measurement. Identifiers: *Cobble abrasion.

Particle size of sediment in natural streams is modified by sorting, mixing, solution, and abrasion. Dynamic bed-load friction was not calculable, but varies directly with the size and concentration of moving bed loads. Wear was related to total work by abradibility, roundness, and rock strength. Abrasion efficiency of traceable cobbles in ephemeral streams in southern Arizona varied approximately with discharge squared. Field wear measurements compared well with prior laboratory model measurement. Changes in roundness while being transported over bedrock and en route weathering greatly affected the abrasion efficiency in natural streams. (McLachlan-Arizona) 75-10881

FACTORS AFFECTING EROSION IN A SEMI-

ARID WATERSHED, Arizona Univ., Tucson. Dept. of Civil Engineering and Engineering Mechanics. I. R. Davis.

Arizona University, Tucson, Department of Civil Engineering and Engineering Mechanics, MS Thesis, 1974. 89 p, 22 fig, 15 ref.

Descriptors: *Erosion, *Channel erosion, *Stream erosion, *Watersheds(Basins), *Semiarid climates, Erosion control, Sediment transport, Rainfall simulators, Erosion rates, *Arizona, Watershed management, Sediment yield, Sedimentation, Forecasting, Soil physical properties, Equations.

Identifiers: *Sycamore Creek(Arizona), Musgrave equation, Laursen equation.

Three separate erosion studies conducted in the Sycamore Creek watershed of Arizona concluded that a combination of rainfall simulator tests and an analysis of channel sediment-transport capacity provided the best estimate of the erosion potential of the watershed. The erosion rates were not a steady process. Previous studies treated erosion as a steady process and tended to grossly over-predict erosion. The first study was an application of the Musgrave erosion equation to the watershed. The equation predicted erosion with only a small degree of reliability. The second, or channel study was an application of the Laursen equation to the ephemeral stream that transports the erosion material from the watershed. This indicated that the channel could not transport the erosion material. The third, or rainfall simulator study established that the erosion material that could possibly be supplied to the Sycamore Creek channel was less than predicted in the initial study. (McLachlan-Arizona)

STABILIZATION AND RECONSTRUCTION OF TEXAS COASTAL FOREDUNES VEGETATION, WITH

Texas Tech Univ., Lubbock For primary bibliographic entry see Field 2L. W75-10887

CONCURRENT NITRIFICATION-DENITRIFI-CATION AT THE SEDIMENT-WATER INTER-FACE AS A MECHANISM FOR NITROGEN LOSSES FROM LAKES,

Wisconsin Univ., Madison. Dept. of Soil Science. For primary bibliographic entry see Field 5C. W75-10902

Field 2-WATER CYCLE

Group 2J—Erosion and Sedimentation

STOCHASTIC ANALYSIS OF PARTICLE MOVEMENT OVER A DUNE BED,

Geological Survey, Bay Saint Louis, Miss B. K. Lee, and H. E. Jobson.

Open-file report 75-358, March 1975. 205 p, 20 fig,

Descriptors: *Sediment transport, *Particle size, *Model studies, *Alluvial channels, *Stochastic processes, Streamflow, Analytical techniques, Equations, Dune sands, Sediments. Identifiers: River dune bed.

Stochastic models are available that can be used to predict the transport and dispersion of bed-material sediment particles in an alluvial channel. These based on the proposition that the movement of a single bed-material sediment particle consists of a series of steps of random length separated by rest periods of random duration and, therefore, application of the models requires a knowledge of the probability distributions of the step lengths, the rest periods, the elevation of particle deposition, and the elevation of particle erosion. The procedure was tested by determining distributions from bed profiles formed in a large laboratory fiume with a coarse sand as the bed material. The elevation of particle deposition and the elevation of particle erosion can be considered to be identically distributed, and their distribution can be described by either a 'truncated Gaussian or a 'triangular' density function. The conditional probability distribution of the rest period given the elevation of particle deposition closely followed the two-parameter gamma distribution. The condi-tional probability distribution of the step length given the elevation of particle erosion and the elevation of particle deposition also closely followed the two-parameter gamma density function. For a given flow, the scale and shape parameters describing the gamma probability distributions can be expressed as functions of bed elevation. (Woodard-USGS) W75-10942

BEACH EROSION CONTROL STRUCTURE, For primary bibliographic entry see Field 8A. W75-11075

THE WATER QUALITY AND BOTTOM SEDI-MENT CHARACTERISTICS OF NEW JERSEY LAGOON DEVELOPMENTS, Rutgers - the State Univ., New Brunswick, N.J.

For primary bibliographic entry see Field 5B. W75-11104

MATAGORDA ISLAND, TEXAS: THE EVOLU-TION OF A GULF COAST BARRIER COM-PLEX.

Michigan Univ., Ann Arbor. Dept. of Geology and Mineralogy.
For primary bibliographic entry see Field 2L.

W75-11144

WEYL'S THEORY OF GLACIATION SUP-PORTED BY ISOTOPIC STUDY OF NORWEGI-

Centre National de la Recherche Scientifique, Gif-sur-Yvette (France). Centre des Faibles Radioac-

J. C. Duplessy, L. Chenouard, and F. Vila. Science, Vol 188, No 4194, p 1208-1209, June 20, 1975. 1 fig, 16 ref.

Descriptors: *Isotope studies, *Glaciers, *Benthic fauna, *Glacial sediments, Temperature, Sea water, Core logging, Cores, Oxygen, Stable isotopes, Glaciology, Sedimentology, Oceanography, Deep water, Sinks.
Identifiers: *Norwegian Sea, *North Atlantic,

Foraminifera.

Oxygen isotopic analyses of pelagic and benthic foraminifera from core K 11 indicate that during

the last glaciation Norwegian Sea bottom waters were warmer than in modern times and had the same physical parameters (temperature, oxygen isotope ratio, and salinity) as the North Atlantic deep water. This result indicates that the glacial Norwegian Sea was not a sink for dense surface water, as it is now, and that during glacial times North Atlantic deep water invaded the deep Norwegian basin. (Sims-ISWS) W75-11153

DENUDATION STUDIES: CAN WE ASSUME STREAM STEADY STATE,

Wisconsin Univ., Milwaukee. Dept. of Geography. S. W. Trimble. Science, Vol 188, No 4194, p 1207-1208, June 20,

1975. 1 fig, 9 ref.

Descriptors: *Erosion, *Sedimentation, *Streams, *Southeast US, Sediment yield, Erosion rates, Alluvium, Colluvium, Bed load, Suspended load, Suspended solids, Sediment transport, Agricul-ture, Reservoirs, Rivers.

Identifiers: Gross erosion, Eroded materials.

Contemporary stream sediment loads are dubious indicators of regional denudation. Recent analysis of 10 river basins in the southeastern United States indicates that of the material eroded from upland slopes since European settlement, only about 5% been exported. The remainder, alluvium and colluvium, will probably not be exported because of extensive reservoir impoundments. (Sims-W75-11154

MASS-EMPLACED SAND-FINGERS MARAROA CONSTRUCTION SOUTHERN NEW ZEALAND, SITE,

Otago Univ., Dunedin (New Zealand). Dept. of R M Carter

Sedimentology, Vol 22, No 2, p 275-288, May 1975. 9 fig, 15 ref.

Descriptors: *Sediments, *Sedimentary structures, *Sediment transport, Mass transfer, Sands, Sand waves, Sedimentation, Sedimentology, Movement, Excavation, Dam construction, Deposition(Sediments), Geomorphology Identifiers: *New Zealand, Sand fans, Sand fin-

During work on a dam construction site in South Island, New Zealand, outflowing groundwater resulted in extensive local mass transport of the sands being excavated. A series of small scale sand fans was built up, probably mainly by laminar mass-flow processes. The surfaces of the fans were made up of a series of complexly interdigitating sand fingers that are inferred to have been emplaced by viscous plug flow. Other sedimentary processes associated with the building and synsedimentary destruction of the fans included rapid grain flow, liquefaction, and progressive slumping. Although small in scale, the Mararoa mass-flowfans may be a close analogue for some of the many 'fluxoturbidite' or 'proximal flysch' facies described in the sedimentological literature. Their geologic implications were therefore briefly discussed. (Sims-ISWS) W75-11161

SIZE-SORTING DURING SUSPENSION TRANS-PORTATION--LOGNORMALITY AND OTHER CHARACTERISTICS,

Indian Statistical Inst., Calcutta. Geological Stu-

S. Sengupta Sedimentology, Vol 22, No 2, p 257-273, May 1975. 13 fig, 2 tab, 13 ref.

Descriptors: *Sediments, *Sieve analysis, *Sediment transport, *Particle size, Suspended Descriptors: solids, Sands, Sediment sorting, Sediment load,

Bed load, Running waters, Laboratory tests, Flumes, Sedimentation, Sedimentology, Distribution patterns, Velocity, Turbulent flow. Identifiers: Lognormality.

Se

Grain size distributions of the suspended loads above a bed of bimodal size distribution (size range 2.00-0.04 mm) were studied in a laboratory flume at water velocities varying from 42 to 160 cm/s. With increase of velocity, the phi (logarithmic) size distribution of the suspended particles (at 5-20 cm above the bed) changed from a strongly skewed to a nearly symmetrical, unimodal form (nearly lognormal) through an intermediate bimodal stage. At low velocity, the skewness of the distribution changed from positive to negative with increase of height. The experiments indicate that lognormality of 'weight frequency' distribution of grain sizes is a transi-tional feature, attained through size sorting within a critical range of velocity and height above a sand bed of a given composition. The observed changes in the size distribution patterns were effected by a differential rate of increase in weight in the different size classes in suspension with increase of flow velocity. The phenomenon could be ex-plained by the equation of relative suspension concentration which relates the relative concentration of a suspended particle of a particular diameter to the flow velocity of the turbulent fluid and the height of suspension above the bed. (Sims-ISWS) W75-11162

INVESTIGATION OF THE OPERATING CHARACTERISTICS OF THE IOWA SEDI-MENT CONCENTRATION MEASURING

Iowa Univ., Iowa City. Inst. of Hydraulic Research.

A. Locher, J. R. Glover, and T. Nakato. IIHR Report No 170, November 1974, 100 p, 40 fig, 6 tab, 15 ref. Army Contract DACW-72-73-C-

Descriptors: *Instrumentation, *Sediment distribution, *Suspended solids, Laboratory tests, Calibrations, Calibrations, Sediment load, Entrainment, Laboratory equipment, Measurement, Turbu-

Identifiers: *Sediment concentration, *Sediment sampler, Spectral analysis, Oscillatory flow, Instrument response.

Results of an investigation conducted to evaluate the capabilities and limitations of the Iowa Sediment Concentration Measuring System (ISCMS) were presented. The manner in which the ISCMS responded to a group of particles and to a single particle was presented. Specifically, problems with nonuniformities in the transducer field and problems created by inadequate frequency response were discussed. The results of tests conducted in an oscillatory flow facility were evaluated and the use of the ISCMS for measuring the instantaneous suspended sediment concentration was reviewed. Recommendations for improve-ment of the instrument were also suggested. (Adams-ISWS) W75-11163

APPLICATION OF THE MANOMETRIC TECHNIQUE IN THE STUDY OF SEDIMENT OXYGEN DEPLETION.

Canada Centre for Inland Waters, Burlington (Ontario). For primary bibliographic entry see Field 5C. W75-11222

SEDIMENT PROCESSES IN GREAT LAKES, Canada Centre for Inland Waters, Burlington (Ontario).

In: Ninth Canadian Hydrology Symposium, Fluvial Processes and Sedimentation, May 1973, Edmonton, Alberta, p 465-492. 1 fig. 97 ref. Descriptors: *Sedimentology, *Great Lakes, *Lakes, *Sedimentation, Erosion, *Geology, Sediment transport, Sediment yield, Currents(Water), Shores, Beaches, Clays, Sands, Movement, Dunes, Silts, Bottom sediments, Sediment distribution, Lake shores, Waves(Water), River flow, Water circulation, Winds, Upwelling,

In the Great Lakes, shoreline and nearshore sedimentation processes are influenced by bedrock and regional geology but processes controlling response to sub-aerial and sub-aqueous influences are poorly understood. Active beach zones are confined to narrow vertical ranges, sediment transport paths are restricted to basins, flocculation rates are slower, and silt size particulates are not well differentiated from sand and clay. Sedi-ment transport by bedload and saltation processes are of limited importance, as reflected by scarcity of sedimentary features. These characteristics in-dicate that energy associated with water level fluctuations, seiches, and baroclinic circulations is less than in most tide driven systems of epicontinental and partly enclosed areas. Wind wave action is less intense and lacks the compounding effect of surface swell generated beyond local areas. Salinity is negligible. Physical processes dominate response of sedimentary environments but geochemical and biological processes are important, especially in transitional and deep mid-lake zones. Because lake studies involve 'low energy fields,' sensitive environmental indicators are needed. Lake systems are generally closed and sediment distributions reflect decreasing energy from nearshore to offshore which are sensitive to changes in effective energy. Variations are related to kinetic, baroclinic, basotrophic, upwelling, and thermal situations. (Buchanan-Davidson--Wisconsin) W75-11237

PRELIMINARY INFORMATION ON THE NATURE OF ORGANIC MATTER IN THE SURFACE SEDIMENTS OF LAKES HURON, ERIE, AND ONTARIO, Canada Centre for Inland Waters, Burlington

(Ontario).
A. L. W. Kemp.
In: Proceedings Symposium on Hydrogeochemistry and Biogeochemistry, Vol 1, Earl Ingerson, editor. Clarke Company, Washington, D.C. 1973, p 40-48, 1 fig, 3 tab, 16 ref.

Descriptors: *Organic matter, *Great Lakes, *Humus, *Lake sediments, Organic compounds, Sedimentology, Bottom sediments, Humic acids, Fulvic acids, Organic acids, Separation techniques, Nitrogen, *Lake Huron, *Lake Erie, *Lake Ontario Identifiers: Bitumens, Humins, Kerogens.

Analysis of the top centimeter of sediment from Lakes Huron, Erie, and Ontario showed little dif-ference in bitumen, humic acids, fulvic acids, and humine regardless of sediment type, depth, or location, indicating horizontal mixing of autochthonous organic matter before sedimenting. Results suggested a common organic precursor material for the lakes. Organic matter in surface sediment appeared to represent complex, relative-ly inert molecules, with most of the labile, simpler organic compounds eliminated in the water column. A 30-day alkali extraction removed 20% more fulvic and humic acids from the sediment. The organic matter contained bitumens (6-10%), humic and fulvic acids (21-36%), and humins (60-71%). The kerogen fraction was proporitional to lake trophic levels, indicating that bottom organ-isms are primarily responsible for early diagenesis of organic matter in sediments. The organic matter in Great Lakes sediment was similar to that of USSR tundra subsoils. Infrared and visible spectra of humic acids were similar to soil humic compounds. A major difference between sediment and soils was the high nitrogen values due to differences in precursor materials. The elemental analyses indicated that the Great Lakes humic acids are similar to those in small Japanese lakes and marine sediments. (Buchanan-Davidson--Wisconsin) W75-11240

2K. Chemical Processes

SALT AND SPECIFIC ION EFFECTS ON GER-MINATION OF FOUR GRASSES,

Arizona Univ., Tucson. Dept. of Soils, Water, and

Engineering. J. Ryan, S. Miyamoto, and J. L. Stroehlein. Journal of Range Management, Vol 28, No 1, p 61-64, January 1975. 1 tab, 2 fig, 12 ref.

Descriptors: *Range grasses, *Range management, *Salt tolerance, *Grazing, *Revegetation, Salts, Germination, Osmotic pressure, Erosion control, Irrigation, Drought tolerance, Ions, Chlorides, Sulfates.

Identifiers: Blue panicgrass, Lehmann lovegrass, Wilman lovegrass, Weeping lovegrass.

The effects of NaCl, CaCl2, MgCl2, Na2SO4, MgSO4, and CaSO4 on four range grasses, blue panicgrass. Lehmann lovegrass, Wilman lovegrass, and weeping lovegrass were in-vestigated. Increased salt concentrations vestigated. Increased salt concentrations decreased germination, but the species and type of salt varied the extent of the decrease. Inhibition was greatest with Mg and least with Ca salts. At equal osmotic pressures the effect of specific ions also varied. Wilman and weeping lovegrasses were relatively salt tolerant. Germination of range grass species is influenced not only by salt concentra-tions, but also by the nature of the ions in the salt solution. Based on this information, plant species selections can be chosen that are best adapted to native soil conditions or where the salt composition has been altered by management or irrigation. (Mastic-Arizona) W75-10894

NEAR-BOTTOM CHEMISTRY IN THE EAST-ERN PACIFIC AND NORTH ATLANTIC

Oregon State Univ., Corvallis. School of Oceanog-

H. Culberson, and R. M. Pytkowicz.

Limnology and Oceanography, Vol 20, No 3, p 463-467, May 1975. 1 tab, 30 ref. ONR Contract N00014-67-A-0369-0007

Descriptors: *Water chemistry, *Atlantic Ocean, *Pacific Ocean, *Inorganic compounds, *Chemistry, Bodies of water, Stratification, Chemical analysis, Salinity, Oxygen, Dissolved oxygen, Hydrogen ion concentration, Alkalinity, Silicates, Phosphates, Nitrates, Chemical properties, Mineralogy, Sea water, Chlorides, Sampling, Sediments.

Identifiers: *Near-bottom chemistry, *Caribbean

Near-bottom chemistry at depths greater than 2000 m was studied in the eastern tropical Pacific (27 stations), the north-eastern Pacific (9 stations), the Caribbean Sea (1 station), and the North Atlantic (2 stations). Salinity oxygen, pH, alkalinity, silicate, phosphate, and nitrate were measured at eight heights from 0.6 to 300 m above the bottom. No measurable salinity, oxygen, alkalinity, silicate, phosphate, or nitrate gradients were observed. A statistically significant near-bottom increase in pH was found, but the increase was small and could have resulted from undetected analytical or sampling errors. (Henley-ISWS) W75-10923

CIAL MATERIALS IN THE VICINITY SHAWANGUNK MOUNTAIN, NEW YORK, For primary bibliographic entry see Field 5A. W75-10928 GEOCHEMICAL RECONAISSANCE OF SURFI-VICINITY OF THE MINOR AND TRACE ELEMENTS, GAS, AND ISOTOPE COMPOSITIONS OF THE PRIN-CIPAL HOT SPRINGS OF NEVADA AND OREGON.

Geological Survey, Menlo Park, Calif. R. H. Mariner, T. S. Presser, J. B. Rapp, and L. M.

Open-file report, August 1975. 27 p, 2 fig, 9 tab, 11

Descriptors: *Chemical analysis, *Hot springs, *Basic data collections, *Nevada, *Oregon, Water quality, Thermal water, Geothermal studies, Water quality, Water chemistry, Inorganic com-pounds, Trace elements, Gases, Sampling, Analytical techniques.

Current interest in the geothermal potential of hot spring areas in Nevada and Oregon makes all data on hot springs in these areas valuable. Tabulated without interpretative comment are compositions of gases (oxygen plus argon, nitrogen, methane, and carbon dioxide), deuterium and oxygen (18) contents of the hot spring waters, trace and minor element chemical data for hot springs sampled in 1972 and 1973, and complete chemical analyses for several hot springs sampled in 1974. The detection limits for nickel and selenium were 0.05 mg/liter and 0.003 mg/liter, respectively. Detectable amounts of nickel were found in Oregon at Olene Gap Hot Spring (0.05 mg/liter) and in Nevada at West Pinto Hot Spring (0.05 mg/liter). Selenium in detectable amounts (0.003 mg/liter or more) was found in Oregon at Hunters Hot Springs (0.008), and in Nevada at the steam geyser at Needle Rocks (0.006), Bog Hot Springs (0.004), and the unnamed hot spring in Jersey Valley (0.003). (Woodard-USGS) W75-10937

WATER RESOURCES OF THE LOWER ST. CROIX RIVER WATERSHED, EAST-CENTRAL MINNESOTA.

Geological Survey, Reston, Va. For primary bibliographic entry see Field 7C. W75-10945

WATER RESOURCES OF THE SNAKE RIVER WATERSHED, EAST-CENTRAL MINNESOTA, Geological Survey, Reston, Va. For primary bibliographic entry see Field 7C. W75-10946

WATER RESOURCES OF THE LOWER MIN-NESOTA RIVER WATERSHED, SOUTH-CEN-TRAL MINNESOTA.

Geological Survey, Reston, Va. For primary bibliographic entry see Field 7C. W75-10947

WATER RESOURCES OF THE CANNON RIVER WATERSHED, SOUTHEASTERN MIN-NESOTA,

Geological Survey, Reston, Va. For primary bibliographic entry see Field 7C W75-10948

CONTINUOUS AUTOMATIC MONITORING OF SURFACE WATER WITH FISH. Keuringsinstituut voor Waterleidingartikelen. Rij-

swijk (Netherlands). For primary bibliographic entry see Field 5A

URANIUM MINERALIZATION BY GROUND WATER IN SEDIMENTARY ROCKS, JAPAN. Power Reactor and Nuclear Fuel Development Corp., Tokyo (Japan). Raw Materials Div For primary bibliographic entry see Field 2F. W75-11145

Field 2-WATER CYCLE

Group 2K—Chemical Processes

A STUDY OF FACTORS CONTROLLING THE CHEMICAL QUALITY OF WATER IN CART-WRIGHT CREEK BASIN, WILLIAMSON COUNTY, TENNESSEE,

Vanderbilt Univ., Nashville, Tenn. Dept. of

C. L. Sprinkle.

Creek(Tenn).

Available from the National Technical Information Service, Springfield, Va 22161, as PB-244 830, \$6.25 in paper copy, \$2.25 in microfiche. Ms Thesis. Water Resources Research Center Report No 42, August 1973. 147 p, 20 fig, 10 tab, 23 ref, 4 append. OWRT B-018-TENN(2), 1431-0001-3650.

Descriptors: *Water chemistry, *Dissolved solids, *Streams, *Tennessee, Runoff, Groundwater, Water quality, Geology, Rocks, Soils, Chemistry, Chemical analysis, X-ray spectroscopy, Water analysis, Chemicals, Sampling, Leaching, Erosion, Chemical properties, Hydrology. *Cartwright Identifiers: *Dissolution rates,

This study was made to determine the factors controlling the geochemistry of ground and surface waters in a small carbonate drainage basin. In order to obtain a somewhat geographic sample of the 6 geologic formations and 14 soil types exposed in the basin, a total of 30 individual rock and soil samples were collected. Rates of dissolution for the major chemical constituents from the rock and soil samples were determined after 1, 2, 4, 8, 16, 32, 65, 130, 250 days. Assuming a 0.5 day mean-residence time for most of the water flowing from Cartwright Basin, a simple empirical model related the laboratory-measured dissolution rates of the rock and soil units with their porosities and areal extent in the basin to predict the concentrations of 5 ions common to the water flowing in Cartwright Creek. A water sample collected during high flow in Cartwright Creek on July 17, 1972 (approximately one-half day after a storm) had measured values for the 5 ions that matched the predicted concentrations. The model was less successful in predicting ion concentrations for the 12month average Cartwright Creek chemical load. (Sims-ISWS) W75-11164

CONCENTRATION AND GENERA OF ALGAE IN SELECTED ILLINOIS STREAMS, 1971-1973, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 5A.

SPECIFIC CONDUCTANCE METHOD FOR IN SITU ESTIMATION OF TOTAL DISSOLVED

Northern Forest Research Center, Edmonton (Alberta).

For primary bibliographic entry see Field 5A W75-11167

CHELATION STUDY OF COPPER (II): FULVIC ACID SYSTEM,

Canada Centre for Inland Waters, Burlington (Ontario)

For primary bibliographic entry see Field 5B. W75-11219

AND EXTRACTION ANALYTICAL TECHNIQUES FOR PESTICIDES IN SOIL, SEDIMENT, AND WATER,

Wisconsin Univ., Madison. Water Resources

For primary bibliographic entry see Field 5A. W75-11236

2L. Estuaries

STABILIZATION AND RECONSTRUCTION OF TEXAS COASTAL FOREDUNES VEGETATION. WITH

Texas Tech Univ., Lubbock

B. E. Dahl, B. A. Fall, A. Lohse, and S. G. Appan Gulf Universities Research Consortium, Galveston, Texas, Report 139, August, 1974. 343 p. 55 fig, 41 tab, 20 append, 89 ref. DACW 72-72-C-0013.

Descriptors: *Coastal engineering, *Shore protection, *Vegetation effects, *Vegetation establishment, *Erosion control, Texas, Coasts, Beach erosion, Beaches, Soil erosion, Tidal effects, Waves(Water), Dunes, Sands, Wind erosion, Plant populations, Land management, Soil conservation, Soil stabilization, Cover crops, Planting management. Grasses

Identifiers: *Padre Island, Beach grasses, Sea oats, Bitter panicum.

Experiments were conducted from 1969 to 1974 on Padre Island, Texas, to to establish technical specifications and methodologies for the use of beach grasses to construct and stabilize foredunes along the Gulf Coast as storm surge barriers. Bitter panicum and sea oats were the best adapted species for beach plantings, with winter through spring being the most favorable transplanting period. Foredunes were established across overwash channels by creating an elevated, flat, relatively salt-free surface using parallel rows of twofoot-high sand fencing, and then transplanting both grasses. (Robinett-Arizona) W75-10887

ESTUARIES AND COASTAL SEAS: VOL. II,
ASPECTS OF COMPUTATION,
RAND Corp., Santa Maria

J. J. Leendertse, and S-K. Liu.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 501, 55.75 in paper copy, \$2.25 in microfiche. Completion Report R-1764-OWRT, June 1975. 123 p, 62 fig, 26 ref, 4 append. OWRT C-5252(No 4237)(1).

Descriptors: *Estuaries, *Mathematical models, *Numerical methods, Tides, Fluid dynamics, Computer models, Coastal engineering, *Finite differences, *Simulation analysis, Unsteady flow, Model studies, Bays, Coasts. Identifiers: *Three-dimensional flow model.

Different computational aspects of the use of a three-dimensional finite-difference model of estuaries, bays, and coastal seas are described. With this model, salinity and temperature distributions can be computed, together with the flow field, and then coupled to the flow computation by a complicated equation of state. In the model an approximation for the sub-gridscale effects is introduced by use of mass and momentum exchange coefficients. The vertical exchanges are dependent on the Richardson number. The model is tested in bays and estuaries with widely different characteristics (Grevelingen, Chesapeake Bay, San Francisco Bay, and the Strait of Juan de Fuca). The results are presented in graphic form. Effective simulations can be made with the model. (See also W74-04301) W75-10900

AUTOMATED TIDAL COMPUTATIONS,

Department of the Environment, Ottawa (Ontario). Water Resources Branch. For primary bibliographic entry see Field 7C.

NEAR-BOTTOM CHEMISTRY IN THE EAST-PACIFIC AND NORTH ATLANTIC

Oregon State Univ., Corvallis. School of Oceanog-For primary bibliographic entry see Field 2K. W75-10923

STOCHASTIC ANALYSIS OF PARTICLE MOVEMENT OVER A DUNE BED, Geological Survey, Bay Saint Louis, Miss. For primary bibliographic entry see Field 2J. W75-10942

A NOTE ON SALINITY AND TEMPERATURE IN SOME MOROCCAN BRACKISH WATERS, Ghent Rijksuniversiteit (Belgium). Dept. of Zoolo-

Heip, E. De Coninck, P. Engels, G. Engler, and G. Verschueren. Bull Soc Sci Nat Phys Maroc. Vol 52, No 3/4, p 25-

Descriptors: *Salinity, *Brackish water, *Water temperature, Sediments, Air temperature, Atlantic Ocean, Coasts. Identifiers: *Morocco, Polyhaline waters, Hyper-

haline salt mines

A series of measures of temperature and salinity was made in brackish waters along the Atlantic coast of Morocco. All waters examined were polyhaline, except for a series of hyperhaline salt mines. The importance of temperature in the sedi-ment is discussed: temperature in the top layer may rise considerably (7C) above air temperature. In the deeper layers the temperature is lowere than in the air and the water .-- Copyright 1974, Biological Abstracts, Inc. W75-10997

THE INFLUENCE OF THE WARM COOLING THE INFLUENCE OF THE WARM COOLING WATER FROM A FOSSIL FUELED POWER PLANT ON OCEANOGRAPHIC CONDITIONS AND COMPOSITION OF PLANKTON IN OWASE BAY I. WATER TEMPERATURE IN RELATION TO DISTRIBUTION OF MICROPLANKTON, (IN JAPANESE), Shimonoseki Univ. of Fisheries (Japan). For primary bibliographic entry see Field 5C. W75-11030

IMPACT OF THERMAL EFFLUENT FROM STEAM-ELECTRIC STATION ON A MARSHLAND NURSERY AREA DURING THE

Florida Univ. at Marineland, St. Augustine. C.V. Whitney Marine Lab.

For primary bibliographic entry see Field 5C. W75-11032

MANAGEMENT OF RETARDATION OF SALT WATER INTRUSION IN COASTAL AQUIFERS, North Carolina State Univ., Raleigh. Dept. of Civil Engineering

For primary bibliographic entry see Field 2F. W75-11058

MATAGORDA ISLAND, TEXAS: THE EVOLU-TION OF A GULF COAST BARRIER COM-PLEX,

Michigan Univ., Ann Arbor. Dept. of Geology and Mineralogy. B. H. Wilkinson.

Geological Society of America Bulletin, Vol 86, No 7, p 959-967, July 1975. 11 fig. 10 ref.

*Barrier Descriptors: Islands. *Evolution. *Erosion, *Sedimentation, *Gulf of Mexico, *Texas, Estuaries, Gulf coastal plain, Oceans, Sands, Sand bars, Island, Coasts, Bayous, Rivers, Stabilization, Recent epoch, Pleistocene epoch, Geomorphology.

Identifiers: *Matagorda Island(Tex).

Matagorda Island is a wide, sand-rich, barrier-island complex on the central Texas coast. This barrier initially formed as an intermittently emergent sand shoal which migrated landward during the late Holocene transgression and then became stabilized as the Gulf of Mexico reached stillstand. The subaerial portion of the island complex rests on a blanket of middle Holocene Bay-estuarine mud which was desposited behind the landwardmigrating sand body and then was overridden by it. Following stillstand, Matagorda Island prograded Gulfward approximately 1.6 km. During this progradation, two large tidal passes, which connected the Gulf of Mexico with San Antonio and Mesquite Bays, were closed. The island was further modified by migration of Cedar Bayou several miles to the west across the island's southern end. Two sources of sand contributed to is barrier complex. Prior to stillstand, erosion of Pleistocene strandplain sand and middle Holocene fluvial-deltaic sand exposed on the shelf supplied most of the sediment to the early barrier. Following stillstand, with progradation, shelf sands were too deeply submerged to be eroded by Gulf waves. Sand discharged into the Gulf by the Colorado and Brazos Rivers and transported southwestward by longshore currents was desposited on the beach and shoreface of Matagorda Island. (Sims-ISWS) W75-11144

NOTE ON THE MEASUREMENT OF THE RESPONSE OF OCEANOGRAPHIC TEMPERA-

National Bureau of Standards, Washington, D.C. Inst. for Basic Standards. For primary bibliographic entry see Field 7B. W75-11146

EFFECTS OF ENTRANCE LOSS ON HARBOR OSCILLATIONS,

Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering. For primary bibliographic entry see Field 8B. W75-11147

WEYL'S THEORY OF GLACIATION SUP-PORTED BY ISOTOPIC STUDY OF NORWEGI-AN CORE K 11, Centre National de la Recherche Scientifique, Gif-

sur-Yvette (France). Centre des Faibles Radioac-

For primary bibliographic entry see Field 2J. W75-11153

BEHAVIOR OF MN, FE, CU, ZN, CD AND PB DISCHARGED FROM A WASTEWATER TREATMENT PLANT INTO AN ESTUARINE ENVIRONMENT, Maryland Univ., College Park. Dept. of Chemis-

For primary bibliographic entry see Field 5B. W75-11160

STRATEGIC APPROACH TO ESTUARINE EN-VIRONMENTAL MANAGEMENT,

Oregon State Univ., Corvallis. Dept. of Civil Engineering. D. A. Bella

Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of ASCE, Vol 101, No WW1, Paper No 11109, February 1975. p 73-92. 2 fig, 13 ref.

Descriptors: *Estuaries, *Management, Environmental effects, *Harbors, *Oregon, Descriptors: *Comprehensive planning, Ecology, Water management(Applied), Environmental engineer-

Ecological systems must be examined from a spectrum of views ranging from those of high perspective-low detail to those of low perspective-high detail. Such a spectrum should provide complementary views of real world systems, the 'true' nature of which is beyond our capacity to perceive. A high perspective low detail view is employed herein to examine the organization, function, and requirements of whole estuarine systems. Con-cerns pertinent to comprehensive environmental planning of estuaries are identified. A planning approach that calls for the uneven distribution of development activities among Oregon's estuarine systems is presented. This approach places a high value on environmental variety, including a wide range of undeveloped ecosystems. Cluster communities with intervening open space are called for within systems selected for development. A number of methods, concerns, and problems related to the implementation of this approach are identified. Although the method is recommended for Oregon's estuaries, emphasis is given to general concepts that have wider applicability. (Bell-Cornell)

AMMONIA EXCRETION BY ZOOPLANKTON AND ITS SIGNIFICANCE TO PRIMARY PRODUCTIVITY DURING SUMMER, Washington Univ., Seattle. Dept. of Oceanog-

raphy. For primary bibliographic entry see Field 5C. W75-11187

A SURVEY OF FISHES AND COMMERCIAL INVERTEBRATES OF THE NEARSHORE AND ESTUARINE ZONE BETWEEN CAPE ROMANO

AND CAPE SABLE, FLORIDA, National Marine Fisheries Service, Panama City, Fla. Gulf Coastal Fisheries Center. For primary bibliographic entry see Field 21.

THE ROLE OF PLANKTONIC PROTOZOA IN THE MARINE FOOD CHAIN. SEASONAL CHANGES, RELATIVE ABUNDANCE, AND CELL SIZE DISTRIBUTION OF TINTINNIDA, New York Aquarium, Brooklyn, Osborn Labs, of

For primary bibliographic entry see Field 5C. W75-11191

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

PHYSIOCHEMICAL TREATMENT OF WASTE-WATER-SEAWATER MIXTURE BY ELEC-

Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W75-10979

MEMBRANE DESALTING GETS BIG PUSH, Office of Water Research and Technology, Washington, D.C.

M. E. Mattson. Water and Wastes Engineering, Vol 12, No 4, p 35, 36, 38, 40, 42, April, 1975. 7 fig.

Descriptors: *Waste water treatment, *Municipal water, *Membrane processes, Electrodialysis, Reverse osmosis, Capital costs, Operating costs, Design, Economics, Desalination processes, *Treatment facilities, California, Colorado River. Identifiers: Brackish water desalting.

Two large brackish water membrane desalting plants are near completion. One, in Santa Ana, California, has planned a multi-phase program for its 75 mgd facility to test reverse osmosis (RO), electrodialysis (ED), and ion exchange. On the lower Colorado River, an even larger desalting plant, of 100 mgd, is planned, with a test facility at Yuma, Arizona to evaluate pre-treatment and to compare reverse osmosis, and electrodialysis and the use of a combination of these two processes. Design characteristics, advantages, problems, and costs of RO and ED are detailed. While both methods have only recently been applied to large municipal water systems (ED in 1962, RO in 1971), treatment plant personnel have been satisfied with each. Economic comparisons of the two mem-brane processes indicate that: the two desalting applications are competitive with each other; with low salinity brackish waters (under 5000 ppm TDS), ED has a slight advantage over RO; capital costs and operating costs for ED systems decreases more rapidly with increasing plant size; and, RO is not as sensitive to variations in feed salinity as ED. Actual operating and capital costs at several large municipal plants show that local conditions such as plant load factors or fouling problems cause much variation. Both reverse osmosis and electrodialysis are recommended for future usage. (Prague-FIRL) W75-10982

CALCIUM SULFATE SOLUBILITY IN BRACKISH WATER CONCENTRATES AND APPLICATIONS TO REVERSE OSMOSIS PROCESSES: POLYPHOSPHATE ADDITIVES,

Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5D. W75-11004

ELECTROLYTIC SEA WATER PROCESS, Diamond Shamrock Corp., Cleveland, Ohio. (assignee)

R. E. Loftfield, J. E. Bennett, and J. E. Cinke U.S. Patent No 3,893,902, 5 p. 3 fig. 6 ref; Official Gazette of the United States Patent Office, Vol. 936, No 2, p 653-654, July 8, 1975.

Descriptors: *Patents, *Sea water, *Desalination, Waste water treatment, *Water purification, *Electrolysis, Electrodes, Anodes, Cathodes. Identifiers: Hypochlorite.

A method is provided for the electrolysis of sea water which reduces the formation of undesirable deposits on the electrodes of the cell and produces hypochlorite. The cell is comprised of an enclosure containing vertically placed electrodes in an alternating array of anodes and cathodes. Sea water is introduced to the cell at a point below the electrodes through a series of orifices corresponding in number and location to the cathodes. The direction of the orifices is such that the sea water first impinges primarily on nonelectrode surfaces immediately subjacent the electrodes at a velocity of between 5 and 25 feet per second. The sea water velocity through the cell is maintained sufficient to at least suspend substantially all particulate matter at least suspend substantially all particulate matter present. Electrolysis is intermittently halted and the cell is flushed with sea water introduced through orifices at a point above, and directed onto the electrodes. This removes a slurry of par-ticulate material from the bottom of the cell and electrolysis can be resumed. (Sinha-OEIS) W75-11068

SYSTEM FOR OPTIMAL PRESSURE CONTROL IN A MULTI-STAGE EVAPORATION

Deutsche Texco A.G., Hamburg. (West Germany). (assignee)

tassignee, A. Hoppe, and W. Geistert. U.S. Patent No 3,894,915, 4 p, 3 fig, 11 ref; Official Gazette of the United State Patent Office, Vol 936, No 3, p 998, July 15, 1975.

Descriptors: *Patents, *Water quality, *Water pol-lution treatment, *Evaporation, Condensation, Distillation, Equipment, Evaporators, *Heat exchangers, Desalination.

Field 3-WATER SUPPLY AUGMENTATION AND CONSERVATION

W75-10896

Group 3A-Saline Water Conversion

A system for optimal pressure control in a multistage evaporation unit is comprised of two or more series connected evaporation stages with at least one of the stages preceded by a heat source. The fresh or feed solution is passed through heat exchangers where it is heated by means of the vapors from the subsequent evaporation stages. The heat exchanger is adapted to permit free flow of the vapor condensate through the heat exchanger inner portion. The heat exchanger installed in the line through which the vapor effluent leaves the higher-pressure evaporation unit acts as a throttling means to permit unimpeded passage of the vapor condensate and assumes the pressure expanding function formerly performed by the pressure control valve. (Sinha-OEIS) W75-11070

3B. Water Yield Improvement

DIFFERENTIAL RELEASE OF WATER FROM

ARIZONA SNOWPACKS, Arizona Univ., Tucson. Dept. of Watershed Management.

For primary bibliographic entry see Field 2C. W75-10860

HYDROGEOLOGY AND WATER RESOURCES OF MIDDLE KIRKLAND CREEK BASIN, YAVAPAI COUNTY, ARIZONA,

Arizona Univ., Tucson. Dept. of Hydrology and Water Resources

For primary bibliographic entry see Field 4B. W75-10872

EFFECTS OF PINYON-JUNIPER REMOVAL NATURAL RESOURCE PRODUCTS AND

USES IN ARIZONA,
Forest Service (USDA), Phoenix, Ariz. Rocky Mountain Forest and Range Experiment Station. W. P. Clary, M. B. Baker, P. F. O'Connell, T. N. Johnsen, Jr., and R. E. Campbell.

Research Paper RM-128, October, 1974, 28 p, 12 fig, 9 tab, 78 ref.

*Water yield Descriptors: improvement. *Vegetation effects, *Pinyon pine trees, *Juniper trees, Herbicides, Forages, Small watersheds, Sediment yield, Water quality, Wildlife, Recrea-tion, *Arizona, Multiple-purpose projects.

Results of water yield improvement tests are evaluated with regard to their impacts on multiple uses of the land. Included in this examination are water quality and quantity, overstory vegetation, un-derstory vegetation, potential livestock carrying capacity, wildlife values, and recreation and aesthetics. Pinyon-juniper removal was done by cabling, herbicide, and felling in an attempt to improve water yields. Of the three treatments only the herbicide treatment with picloram appears to provide an increase in water yield, but the negative aesthetic effect of dead standing trees was undesirable. Overstory vegetation removal will result in a severalfold increase in herbage production for livestock and wildlife. There was no meaningful increase in sediment yield as a result of overstory removal. A combination of herbicide treatment and fire appears the most promising method for future juniper control research from the standpoint of water production, forage production, deer response, and economics. (Mastic-Arizona) W75-10886

REVEGETATING DISTURBED AREAS IN THE

SEMIARID SOUTHWEST,
Forest Service (USDA), Albuquerque, N. Mex.
Rocky Mountain Forest and Range Experiment

For primary bibliographic entry see Field 4D. W75-10892

APPROXIMATE ANNUAL WATER BUDGETS OF TWO CHAINED PINYON-JUNIPER SITES. Utah State Univ., Logan. Watershed Science Unit. For primary bibliographic entry see Field 4A

WIND EFFECTS ON CHEMICAL FILMS FOR EVAPORATION SUPPRESSION AT LAKE HEFNER.

Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering. F. R. Crow, and A. L. Mitchell, Jr.

Water Resources Research, Vol 11, No 3, p 493-495, June 1975. 4 fig, 8 ref. Bureau of Reclamation Contract 14-06-5629.

Descriptors: *Evaporation control, *Winds, *Films, *Lakes, *Oklahoma, Evaporation, Hexadecanol, Octadecanol, Slurries, Application equipment, Application methods, Retardants, Thin films, Research and development, Alcohols, Rates of application, Wind velocity. Identifiers: *Lake Hefner(OK), Wind direction.

An evaporation suppression research project was conducted at Lake Hefner, Oklahoma, where water-based slurries of hexadecanol and oc-tadecanol were applied at the upwind side of the lake by an offshore sprinkler system. The distribution system was designed for maximum film cover under south winds. The chemical was applied at a variable rate adjusted to the demand created by local wind speed and direction. The application rate required to replace film removed by the wind, in terms of pounds per hour per foot of distribution line perpendicular to the wind, averaged 6.5-8 times greater than for an experimental pond with a similar application system. The upper wind speed limit for successful film application was 13 miles per hour (mph). Distribution studies were made to determine the percent of time that wind speeds and directions were favorable to the application of film, i.e., with speeds less than 13 mph and direction between 135 degrees and 225 degrees azimuth. Under wind conditions experienced in Oklahoma it was difficult to maintain continuous film cover because of the frequency of occurrence of high wind speeds and shifts in wind direction. (Roberts-ISWS) W75-10920

AN APPRAISAL OF POTENTIAL WATER SALVAGE IN THE LAKE MCMILLEN DELTA AREA, EDDY COUNTY, NEW MEXICO,

Geological Survey, Reston, Va.
E. R. Cox, and J. S. Havens.
Available from Supt. of Documents, GPO,
Washington, D.C. 20402, \$1.50 in paper copy.
Water-Supply Paper 2029-E, 1974, 26 p, 4 fig, 2
plate, 8 tab, 11 ref.

Descriptors: *Water conservation, *New Mexico, *Evapotranspiration control, *Phreatophytes, *Tamarisk, Reservoirs, Evapotranspiration, Water yield improvement, Water reuse. Identifiers: *Lake McMillan(N Mex).

The amount of water used by saltcedar in the area of the old delta of Lake McMillan, New Mexico, and the amount of water that might be salvaged by eradication of saltcedar by construction of flood-ways through the delta area are estimated. Saltcedar growth increased from about 13,700 acres in 1952 to about 17,000 acres in 1960, a 25% increase. Most of this increase was in the areal density range near zero to 30%. The estimated average transpira tion of phreatophytes in the Artesia to Lake Mc-Millan reach is 29,000 acre-feet of water per year. In the reach from Artesia to the Rio Penasco, where the regional water table is above the Pecos River, saltcedar eradication might salvage from 10,000 to 20,000 acre-feet of water per year for use downstream. From the Rio Penasco to Lake Mc-Millan, the river is perched above the water table; therefore, elimination of the saltcedar would probably not increase flow in the river, nor would drains be effective. Clearing in this reach, however, might increase the flow at Major Johnson Springs below Lake McMillan. Floodways through this reach would eliminate some evapotranspiration but might increase the sediment deposited by floodwaters in Lake McMillan. (Woodard-USGS) W75-10941

Fe

DEVELOPMENT OF A BIBLIOGRAPHIC INFORMATION SYSTEM FOR WATER YIELD IMPROVEMENT PRACTICES,

Arizona Univ., Tucson. School of Renewable Natural Resources.

For primary bibliographic entry see Field 10B. W75-11050

AN ELEVATIONAL CONTROL OF PEAK SNOWPACK VARIABILITY,

Colorado Univ., Boulder. Inst. of Arctic and Alpine Research; and Colorado Univ., Boulder. Dept. of Geography.

For primary bibliographic entry see Field 2C. W75-11155

WIND-SNOW RELATIONS AT MARMOT CREEK, ALBERTA,

Atmospheric Environment Service, Calgary (Alberta). For primary bibliographic entry see Field 2C. W75-11226

HYDROLOGIC RELATIONS UNDISTURBED AND CONVERTED BIG SAGEBRUSH LANDS: THE STATUS OF OUR KNOWLEDGE.

Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. For primary bibliographic entry see Field 4D. W75-11313

3C. Use Of Water Of Impaired Quality

USE OF AMENDMENTS TO REDUCE WATER REQUIREMENTS FOR STAND ESTABLISHMENT OF SMALL-SEEDED CROPS,

Arizona Univ., Tucson. Dept. of Plant Sciences. For primary bibliographic entry see Field 3F. W75-11045

CHANGES IN VEGETATION AND SURFACE SOIL PROPERTIES FOLLOWING IRRIGATION OF WOODLANDS WITH MUNICIPAL WASTE-

Michigan State Univ., East Lansing. Dept. of Forestry.

For primary bibliographic entry see Field 5B W75-11243

STATUS OF WASTE HEAT UTILIZATION AND DUAL-PURPOSE PLANT PROJECTS,

Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 3E.

3D. Conservation In Domestic and Municipal Use

SOCIAL IMPACTS OF WATER RESOURCES DEVELOPMENTS AND THEIR IMPLICATION FOR URBAN AND RURAL DEVELOPMENT: A POST AUDIT ANALYSIS OF THE WEBER BASIN PROJECT IN UTAH,

Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources. For primary bibliographic entry see Field 6B. W75-10854

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Conservation In Industry-Group 3E

FLOOD RUNOFF FROM URBAN AREAS, Maryland Univ., College Park. Dept. of Civil Engineering.

For primary bibliographic entry see Field 5B. W75-10904

A CASE STUDY OF SOME ECONOMIC ASPECTS OF THE NATIONAL FLOOD INSURANCE PROGRAM,

Mississippi State Univ., Mississippi State. Div. of Business Research.

For primary bibliographic entry see Field 6F. W75-10906

INDUSTRY AND COMMUNITY IN COOPERA-TION.

K-Konsult, Lund (Sweden). For primary bibliographic entry see Field 5D. W75-10985

WATER APPLICATION PRACTICES AND LANDSCAPE ATTRIBUTES ASSOCIATED
WITH RESIDENTIAL WATER CONSUMPTION,
New Mexico State Univ., University Park. Dept. of Horticulture.

D. J. Cotter, and D. B. Croft.

Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 724, \$4.75 in paper copy, \$2.25 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report No 049, Completion Report, November 1974, 112 p, 18 tab, 57 ref, append. OWRT C-4060(No 9012)(1).

Descriptors: *Landscaping, *Aesthetics, *Water conservation, Municipal water, Water consump-tion, Arid climates, Southwest US, Bermuda grass, Fescues, Analytical techniques, New Mexico, Surveys, Water demand, Social values, Water utilization, Measurement.

Identifiers: *Urban landscapes, New Mexico alta rescue, Hybrid Bermuda turf, Factor analysis, *Peak water demand.

The peak water load demand on municipal systems is often caused by water used to maintain urban landscapes. Research was conducted to determine methods for reducing water used on urban landscapes and to enhance the esthetic role of plants in the urban landscape. Two broad approaches were employed: evaluation of water application on urban landscapes in relation to size and type of landscape; and description of esthetic dimensions of urban landscapes in relation to water consumed. Residents applied more water than needed to maintain the landscape, and the specific amounts depended upon the season and landscape type. An instrument, the Residential Landscape Description Questionnaire (RLDQ), was developed for rating the esthetic qualities of a residential landscape. The evidence indicated the RLDZ was highly reliable and valid. The most feasible method of reducing municipal peak water usage is to minimize excesses and utilize landscape design criteria which conserve water and are esthetically attractive. In view of the fact that residents tend to apply up to 50% more water than needed to maintain the esthetic and health qualities of the landscape, it is recommended that an educational program be initiated to improve the water application practices as well as the design of landscapes as one technique for reducing the amount of water used to maintain residential landscapes. (Hain-New Mexico State) W75-11059

LAND AND WATER RESOURCES SURVEY IN THE JEBEL MARRA AREA, THE SUDAN Food and Agriculture Organization of the United

Nations, Rome (Italy). For primary bibliographic entry see Field 4A. W75-11139

HYDROLOGIC INVESTIGATION AND DESIGN OF URBAN SYSTEMS, STORMWATER

Snowy Mountains Engineering Corp., Canberra (Australia). For primary bibliographic entry see Field 4A. W75-11141

THE DESIGN OF STORM WATER DRAINAGE CHANNELS USING MATHEMATICAL MODEL

Hydraulics Research Station. Wallingford (England). For primary bibliographic entry see Field 8B. W75-11150

AN IMPLICIT APPROACH TO PRICING AGRICULTURAL WATER TRANSFERS TO URBAN USES,

Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A. W75-11178

VACUUM DISTILLATION/VAPOR FILTRA-TION WATER RECOVERY,

General American Transportation Corp., Niles, Ill. For primary bibliographic entry see Field 5D.

3E. Conservation In Industry

IMPACT OF ENERGY DEVELOPMENT ON THE LAW OF THE COLORADO RIVER, California Univ., Los Angeles. School of Law. For primary bibliographic entry see Field 4C. W75-10869

INDUSTRY AND COMMUNITY IN COOPERA-

K-Konsult, Lund (Sweden). For primary bibliographic entry see Field 5D. W75-10985

LEGAL AND INSTITUTIONAL PROBLEMS IN THE MANAGEMENT OF SALINITY, Washington Univ., Seattle. School of Law For primary bibliographic entry see Field 5G. W75-11047

IMPROVED DESIGN AND OPERATING CRITERIA FOR RURAL WATER DISTRICTS, Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 6D. W75-11056

DESIGN CONSIDERATIONS--WATER AND EF-FLUENT DISPOSAL,

For primary bibliographic entry see Field 5D. W75-11128

STATUS OF WASTE HEAT UTILIZATION AND DUAL-PURPOSE PLANT PROJECTS. Oak Ridge National Lab., Tenn.

S. E. Beall, and M. M. Yarosh. Available from the National Technical Information Service, Springfield, Va 22161 as CONF-73-1101-56, \$4.00 in paper copy, \$2.25 in microfiche. Presented at the American Nuclear Society meeting, San Francisco, California, November 11-16, 1973, 44 p. 18 fig. 5 tab, 26 ref. AEC 731101-56

Descriptors: *Heat transfer, *Heated water, *Heating, *Aquiculture, *Return flow, Energy *Heating, transfer, Powerplants, Tennessee Valley Authority, Commercial shellfish, Cattishes, Steam, Thermal power, Agriculture, Greenhouses, Europe, Heat exchangers, Fish farming, Asia.

Identifiers: *Waste heat, *Dual purpose energy plants, Mariculture, Ploesti(Romania), Japan.

One method for conserving energy is to use heat which has been discharged from some conversion mechanism or industrial process. Although there are incentives to use discarded heat, there are also disincentives: the necessity of locating the user near the heat source, the potential interruptable nature of the service, the possibility of chemical or radioactive contamination, and seasonal variation in source temperature. The status of several pioneering projects in the substitution of onceused heat for heat from fossil fuels is reported. Demonstrations of the economic feasibility of closed-environment agriculture warmed by waste heat, proposed by the Oak Ridge National Laboratory-TVA and by the Northern States Power Company as well as projects already completed by the University of Arizona, are described. The utilization of warm discharge water for irrigation and frost protection for outdoor agriculture and for aquaculture and mariculture is discussed. Salt water shrimp, catfish, oysters, clams and abalone have been successfully raised experimentally in warm waste water enhanced environments. The status of several dual-purpose (electrical power and industrial steam) energy plant projects is assessed. Although significant savings in fuel and improvements in overall efficiency are possible from dual-purpose plants, only limited application of the concept has been made. (Becker-Wisconsin) W75-11251

THE WATER INDUSTRY IN TRANSITION,

National Water Council, London (England). P. E. Stott.

Conference of British Industry Review, No 13, p 22-31, 1974. 1 fig.

Descriptors: *Water management(Applied), *Water policy, *Administrative agencies, Water supply, Water quality control, Regions, Europe, Sewerage, Financing, Income, Regional analysis, Water districts.

Identifiers: *England, *Wales, *Regional adminis-

The implementation of the 1973 Water Act in England and Wales called for a radical restructuring of the administration of water and sewerage functions. Nine regional water authorities in England and the Welsh National Water Development Authority were set up based on river basins, the role of the twelve-member National Water Council was defined, the Water Research Centre was established, and the Water Space Amenity Commission was created. The ten multi-functional regional authorities are responsible for water resources and supply; sewerage and sewage disposal; the prevention of pollution; land drainage and flood protection; fisheries; the recreational and amenity use of their water space; and in some cases, for navigation. The new jurisdictional units need updated information on costs, standards and the state of repair as well as research and development support. Local authorities remain as agents for the development and maintenance of local sewerage systems, and statutory water companies remain as agents for the supply of water within their areas. The coordination of workers from many local authorities remains an important objective. New financing strategies, although authorized, have not been used due to administrative obstacles. A summary of detailed objectives of the massive reorganiza-tion is included. (Becker-Wisconsin) W75-11252

NON-RENEWABLE. NON-ENERGY

RESOURCES, Univ (England). Public Sector Leicester Economics Research Centre. For primary bibliographic entry see Field 6B. W75-11253

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3E—Conservation In Industry

HOW STEAM IS PRODUCED AND HANDLED AT THE GEYERS.

For primary bibliographic entry see Field 4B. W75-11280

SUBSURFACE WATER -- TOOL FOR PETROLEUM EXPLORATION, Mobil Research and Development Corp., Dallas,

Tex. For primary bibliographic entry see Field 4B.

W75-11289

W75-11320

WASTE WATER SURVEY, ST. REGIS PAPER COMPANY, CANTONMENT, FLORIDA. Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div. For primary bibliographic entry see Field 5D. W75-11314

UPGRADING MEAT PACKING FACILITIES TO REDUCE POLLUTION. (PART 1). IN-PROCESS MODIFICATIONS AND PRETREATMENT, Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 5D.

UPGRADING MEAT PACKING FACILITIES TO REDUCE POLLUTION. (PART 2). WASTE TREATMENT,

Bell, Galyardt and Wells, Omaha, Nebr. For primary bibliographic entry see Field 5D. W75-11321

UPGRADING MEAT PACKING FACILITIES TO REDUCE POLLUTION. (PART 3). CHOOSING THE OPTIMUM FINANCIAL STRATEGY, Commins (J. A.) and Associates, Inc., Fort Washington, Pa.

For primary bibliographic entry see Field 5D. W75-11322

POLLUTION ABATEMENT IN A BREWING FACILITY.

Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 5D. W75-11323

UPGRADING METAL-FINISHING FACILITIES TO REDUCE POLLUTION. (PART 1). IN-PROCESS POLLUTION ABATEMENT, Oxy Metal Finishing Corp., Madison Heights, Mich.

For primary bibliographic entry see Field 5D. W75-11324

UPGRADING METAL-FINISHING FACILITIES TO REDUCE POLLUTION. (PART 2). WASTE TREATMENT.

Lancy Labs., Inc., Zelienople, Pa. For primary bibliographic entry see Field 5D. W75-11325

UPGRADING TEXTILE OPERATIONS TO REDUCE POLLUTION. (PART 1). IN-PLANT CONTROL OF POLLUTION. Institute of Textile Technology, Charlottesville,

Virginia.

For primary bibliographic entry see Field 5D. W75-11326

UPGRADING TEXTILE OPERATIONS TO REDUCE POLLUTION. (PART 2). WASTE-WATER TREATMENT SYSTEMS.

Metcalf and Eddy, Inc., Boston, Mass For primary bibliographic entry see Field 5D. W75-11327 **UPGRADING POULTRY-PROCESSING FACILI-**TIES TO REDUCE POLLUTION. (PART 1). IN-PROCESS POLLUTION ABATEMENT, Environmental Engineering, Inc., Gainesville, Fla. For primary bibliographic entry see Field 5D. W75-11328

UPGRADING POULTRY-PROCESSING FACILI-TIES TO REDUCE POLLUTION. (PART 2). PRETREATMENT OF POULTRY-PROCESSING WASTES.

Environmental Protection Agency, Washington, D.C. Technology Transfer Staff. For primary bibliographic entry see Field 5D. W75-11329

UPGRADING POULTRY-PROCESSING FACILI-TIES TO REDUCE POLLUTION. (PART 3).

WASTE TREATMENT.
Giffels Associates, Inc., Detroit, Mich.
For primary bibliographic entry see Field 5D. W75-11330

MEASURES IN THE SULFITE PULP INDUSTRY FOR DECREASING WASTE WATER LOAD (MASSNAHMEN DER SULFITZELLSTOFF-IN-DUSTRIE ZUR MINDERUNG DER ABWASSER-BELASTUNG).

Chemiefaser Lenzing A.G. (Austria) For primary bibliographic entry see Field 5D. W75-11339

POSSIBILITIES OF REUTILIZATION OF KAOLIN FROM BIOLOGICAL WASTE WATER SLUDGES (MOEGLICHKEITEN DER WIEDERVERWERTUNG VON KAOLIN AUS BIOLOGISCHEN ABWASSERCHLAEMMEN), Papierfabrik Biberist (Switzerland). For primary bibliographic entry see Field 5D. W75-11349

3F. Conservation In Agriculture

EFFECTS OF IRRIGATION IN RAIN-FED FIELDS ON THE GROWTH AND YIELD OF UPLAND RICE VARIETIES, (IN KOREAN), Kyungpook National Univ., Taegu (Republic of

Korea). Coll. of Agriculture. S. Y. Jeh.

Res Rep Off Rural Dev (Crop) (Suwon), 16 p 127-132, 1974, Illus.

Descriptors: *Rice, *Irrigation, *Crop production, Growth rate.

Differences of the characters and yield of 14 upland and 2 lowland rice varieties cultivated under irrigated, partially-irrigated and dry field conditions were studied. Under dry conditions, heading and maturity were greatly delayed and ratios of valid tillers, fertilized spiklets and ripen-ing and yield in both rough and brown rice were relatively lower, while numbers of tillers and spikelets and straw weight were greater under the other 2 conditions. There was not substantial difrigated and partially-irrigated conditions.--Copyright 1975, Biological Abstracts, Inc. W75-10853 ference in growth and yield of rice between the irr-

EFFECTS OF ANTITRANSPIRANTS ON YIELD OF GRAIN SORGHUM UNDER LIMITED IR-RIGATION,

New Mexico State Univ., Clovis. Plains Branch Agricultural Experiment Station. H. D. Fuehring.

Agronomy Journal, Vol 65, No 3, p 348-351, 1973.

Descriptors: *Antitranspirants, *Crop production, *Sorghum, Irrigation, Stomata, Grain(Crops). Identifiers: Atrazine, Folicote, Phenylmercuric

The proper material, method and timing of application for field use was determined. Under limited cation for field use was determined. Order limited irrigation conditions in the field, grain sorghum (Sorghum bicolor (L) Moench) was sprayed at various rates and times with phenylmercuric acetate (PMA), atrazine and Folicote. Mean grain yield increases of 5-17% were obtained. Rates of application required were approximately 60 g/ha for PMA, 130 g/ha for atrazine, and 2 l/ha for Folicote. Application just prior to the boot stage was more effective than a later application.--Copyright 1973, Biological Abstracts, Inc. W75-10858

INTERNATIONAL DEVELOPMENT STRATE-GIES FOR THE SAHEL.

For primary bibliographic entry see Field 4A. W75-10861

SUCCESSFUL IRRIGATION: PREPARATION, REALIZATION, EXPLORITATION, (SAVOIR IRRIGUER: PREPARATION, REALISATION, EXPLOITATION),

R. M. Hagan, C. E. Houston, and S. V. Allison. Food and Agriculture Organization of the United Nations, Rome, 1968. 53 p.

Descriptors: *Irrigation programs, *Planning, *Management, *Institutions, *Project planning, *Management, *Institutions, *Project plann Costs, Economic feasibility, Water utilization.

Successful irrigation, its planning, development, and management, are described to assist policy makers, administrators, and planners to discharge more effectively their roles in the development of irrigated agriculture. Successful irrigation requires a skillful combination of the accumulated knowledge in many professional field, including engineering, water-soil-plant sciences, and economic and other social sciences. Guidelines are suggested for the preparation of project proposals, their appraisal, and implementation. The sub-sequent management calls for experienced judgement, gased on a high degree of professional com-petence. (Paylore-Arizona) W75-10874

SPRINKLER IRRIGATION PRACTICE, (LA PRATIQUE DE L'IRRIGATION PAR ASPER-

California Univ., Los Angeles. Water Resources Center A. F. Pillsbury, and A. Degan.

Food and Agriculture Organization of the United Nations, Rome, FAO Agricultural Development Paper, No 88, 1968. 186 p, 66 fig. 88 refs.

Descriptors: *Sprinkler irrigation, *Irrigation practices, *Operation and maintenance, *Hydraulic equipment, *Pumps, Water distribution(Applied), Irrigation systems, Costs, Corrosion, Scaling, Design criteria, Rotational flow.

Discussed are types of land best suited to sprinkler irrigation; types of sprinklers (slow rotation, reaction rotation, nozzle lines, perforated pipe, and fixed head sprinklers); types of sprinkler systems (hand-move, portable, semi-portable, permanent, roll-move, tow units, drag units, solid set, and traveling machines); suitable environments such as soil texture and density, moisture suction, humidity, wind, and evaporation; sprinkler patterns as they relate to uniform coverage; system design and operational criteria, with special reference to problems induced by corrosion; system hydraulic design; pumping plant design; installation, operation, and maintenance; sprinkling in greenhouses; factors such as pesticides, fertilizers, and frost; and economic considerations. (Paylore-Arizona) W75-10875

THE EARLY VEGETATIVE GROWTH OF TWO ANNUAL PASTURE GRASSES (HORDEUM

LEPORINUM LINK AND LOLIUM RIGIDUM

South Australia Dept. of Agriculture, Adelaide. P. S. Cocks, and C. M. Donald.

Australian Journal of Agricultural Research, Vol 24, No 1, p 11-19, January, 1973. 3 fig, 5 tab, 11

Descriptors: *Germination, *Plant growth, "Seeds, "Grasses, "Planting management, Soil-water-plant relationships, "Australia, Weight, Leaves, Root systems, Plant physiology, Vegeta-tion establishment.

Identifiers: Hordeum Leporinum Link, Lolium regidum Gaud.

Early vegetative growth of Hordeum leporinum and Lolium rigidum was studied at 10, 17, and 24C in a controlled environment cabinet. Growth rates for Lolium were generally higher than for Horde um, and significantly so at 17C. Seedling growth rate in each species was more rapid during the period of endosperm availability than after endosperm exhaustion. Following emergence, Hordeum seedlings were larger in total weight, leaf area, root weight, root depth and plant height because of their greater seed size. The duration of Hordeum's greater size depended upon temperature, being least (26 days) at 17C, the temperature for Lolium's optimum growth. Implications of these findings in pasture production in southern Australia are that in sparse stands Lolium seedlings will overtake Hordeum, and in dense stands the reverse will occur. (Michael-Arizona) W75-10876

WATER CONSUMPTION AND WATER TUR-NOVER OF SHEEP GRAZING SEMIARID PASTURE COMMUNITIES IN NEW SOUTH

Commonwealth Scientific and Industrial Research Organization, Deniliquin (Australia). Riverina

A D Wilson

Australian Journal of Agricultural Research, Vol 25, No 2, p 339-347, March 1974. 4 fig, 3 tab, 18

Descriptors: *Sheep, *Water consumption, *Grasses, *Water requirements, Pastures, Vegetation effects, Grazing, *Australia, Rainfall, Grasslands

Identifiers: Water turnover, Shade.

Water consumption and turnover of Merino sheep grazing on three vegetation communities were stu died. Water requirements are high due to high tem-peratures and low moisture content of the forage in the dry season. On Danthonia caespitosa grass-land, maximum water intakes were 3 to 3.5 liters per sheep per day. On saltbush (Atriplex vesicaria) and belah-rosewood (Casuarina cristata -Heterodendrum oleifolium) communities, water intakes were up to 6 to 7 liters per day in summer. The provision of shade reduced water turnover by a maximum of 0.3 to 0.5 liters per day on some occasions only, indicating that shade is of little importance of woolled sheep. Water turnover was measured by tritium dilution. The high water intakes of the sheep were attributed mainly to the high mineral content of the Atriplex and Bassia spp. eaten. Shearing in the cool season is clearly a sound practice in this region of New South Wales. (Mastic-Arizona) W75-10888

DENSITY THE INFLUENCE OF DENSITY AND NITROGEN ON THE OUTCOME OF COMPETI-TION BETWEEN TWO ANNUAL PASTURE GRASSES (HORDEUM LEPORINUM LINK AND LOLIUM RIGIDUM GAUD.),

South Australia Dept. of Agriculture, Adelaide.

P. S. Cocks.

Australian Journal of Agricultural Research, Vol 25, No 2, p 247-258, March 1974. 6 fig, 4 tab, 17

Descriptors: *Competition, *Nitrogen, *Pastures, *Grasses, *Plant growth, Density, *Australia, Growth rates.

Identifiers: Hordeum leporinum Link, Lolium rigidum Gaud.

The hypothesis that the outcome of competition between Hordeum leporinum Link. and Lolium rigidum Guad. depends mainly on the density of the Hordeum in a pasture was tested. The results are explained in terms of the hypothesis and of the different abilities of the two species to absorb soil nitrogen, which is rarely applied to annual pastures and often deficient. In the first experiment, it was found that the competitive ability of Hordeum was closely related to its density. Hordeum was most competitive when its density was highest. In the second experiment, soil nitrogen was an importand modifying factor. At low nitrogen, Hordeum was the successful competitior, and its competitive ability decreased with increases in its density. At high nitrogen, Lolium became the successful competitor. (Mastic-W75-10889

PRODUCTS FROM JOJOBA: A PROMISING

NEW CROP FOR ARID LANDS.
National Research Council, Washington, D.C.
Committee on Jojoba Utilization. National Academy of Sciences, 1975. 30 p, 8 fig, 7

Descriptors: *Indian reservations, *Southwest, US, *Desert plants, Arid lands, Water requirements, Cultivation, Crop production, Hydrogena-tion, Productivity, Wax, Seeds, Seed treatment. Identifiers: *Jojoba, *Economic plants, Plant

In the expectation that an industry based on the seed oil of the desert bush jojoba (Simmondsia chinensis) would improve the economies of Indian reservations in the southwestern desert regions of the U.S., a scientific and technical assessment was made of the practical uses of jojoba oil. The cultivation of jojoba, the manufacture of products from it, and the utilization of its by-products are discussed, with the conclusion that jojoba oil and its hydrogenated product have marketable properties. Special attention is directed to its value to increase productivity of arid lands not suitable for conventional crops, particularly because of its tolerance to extreme desert temperatures and minimal rainfall. Since the plant needs moisture during the winter and spring, its growth schedule fits well with an arid environment where water is needed when it is scarce. It appears to be tolerant of both saline and alkaline soils and to saline irrigation water. The 1972 harvest of 87,000 pounds of seed from wild plants was used for the laboratory work done to support the Committee's conclusions, but the future of the plant lies in developing it into a cultivated crop. Accompanying tables illustrate the wax and protein content of jojoba seeds, characteristics of sulfurized jojoba and sperm oils, and other comparisons. (Paylore-W75-10890

SALT AND SPECIFIC ION EFFECTS ON GER-MINATION OF FOUR GRASSES, Arizona Univ., Tucson. Dept. of Soils, Water, and

Engineering. For primary bibliographic entry see Field 2K. W75-10894

OCCURRENCE OF 2, 4, 5-T AND PICLORAM IN SURFACE RUNOFF WATER IN THE BLACKLANDS OF TEXAS,

Agricultural Research Service, College Station,

For primary bibliographic entry see Field 5B.

THE GERMINATION AND ESTABLISHMENT OF TWO ANNUAL PASTURE GRASSES (HORDEUM LEPORINUM LINK AND LOLIUM RIGIDUM GAUD.),

South Australia Dept. of Agriculture, Adelaide. For primary bibliographic entry see Field 2I. W75-10897

EFFECT OF SOIL-WATER RELATIONS ON THE ROOT POROSITY, TRANSPIRATION AND

Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Dept. of Soil

A. K. Saha, B. P. Ghildyal, and M. S. Gangwar. Indian J Agric Sci, Vol 43, No 5, p 472-477, 1973.

Descriptors: *Roots, *Soil water, *Transpiration, Ions, Absorption, *Rice, Porosity, Loams, Dry matter, Production, Soils. Identifiers: Oryza-Sativa, *India.

A pot experiment was conducted on a silty clayloam soil of Nainital tarai (subhumid and submontane belt at the base of the Himalayas) to investigate the influence of soil-water regimes on rice (Oryza sativa L.) cultivars 'Jaya' and 'IR 8,' grown under flooded condition and field capacity A variation in the soil-moisture regimes from field capacity to flooded condition resulted in a great increase in the total root porosity, transpiration, nutrient uptake and dry matter production. Dry matter production and nutrient uptake showed a high positive correlation with the total amount of water transpired. The amount of water transpired/day/plant was positively correlated with the total root porosity/plant. More nutrient uptake as a result of increased availability of nutrients, together with greater transpirational transfer of water and ions facilitate by increased root porosity, resulted in an increase in the growth of rice plant under flooded condition.--Copyright 1974, Biological Abstracts, Inc. W75-10916

ESTIMATION OF SAFE PERIODS FOR CPOP PLANNING UNDER DRYLAND AGRICUL-TURE.

All-India Coordinated Dryland Agriculture Research Project, Hissar.

O. P. Bishnoi, and S. M. Virmani.
Indian J Agric Sci. Vol 43, No 5, p 429-432, 1973.

Descriptors: *Agriculture, *Crop production, Planning, Plant management, Estimating, farming.

At Hissar a 90-day (18 June-14 Sept.) safe period of water availability for the rainy crop season was determined using normal weekly values of precipitation at the different significant levels of potential evapotranspiration. For the winter crop season this period was 110-120 days as estimated from plant response to the soil-moisture regime, depending on the meteorological and moisturerelease parameters under conditions of stored moisture.—Copyright 1974, Biological Abstracts, Inc. W75-10926

AN APPRAISAL OF POTENTIAL WATER SALVAGE IN THE LAKE MCMILLEN DELTA AREA, EDDY COUNTY, NEW MEXICO, Geological Survey, Reston, Va.

For primary bibliographic entry see Field 3B. W75-10941

USE OF AMENDMENTS TO REDUCE WATER REQUIREMENTS FOR STAND ESTABLISHMENT OF SMALL-SEEDED CROPS,

Arizona Univ., Tucson. Dept. of Plant Sciences.
R. E. Dennis, C. E. Edmond, and C. W. Robbins.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 722,

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F—Conservation In Agriculture

\$3.75 in paper copy, \$2.25 in microfiche. Completion Report, August 1975. 15 p, 16 ref. OWRT A-034-ARIZ(3). 14-31-0001-5003.

Descriptors: Soils, Alfalfa, Sugarbeets, *Soil amendments, *Southwest U.S., Wheat, Barley, Irrigation water, Water requirements.
Identifiers: *Sulfuric acid, *Phosphoric acid, *Soil crusting.

Soil crusting after planting is a serious problem in stand establishment of small-seeded crops in the Southwest. When crusting occurs in a saline, warm soil, stand establishment problems are especially severe. It is customary to use costly irrigation water to keep seedbed surfaces moist after planting to reduce soil crusting, and to lower soil temperatures. Phosphoric acid (24% and 12%) and sulfuric acid (95%) were evaluated to determine their effectiveness in reducing soil crusting and to reduce the amount of water required to obtain stands of sugarbeets, alfalfa, wheat and barley. Phosphoric acid applied in 4-6 cm bands over the seed row at planting and before irrigation, reduced crusting and significantly increased sugarbeet and alfalfa seedling emergence. Emerged seedlings from phosphoric acid treated plots were larger and one irrigation (10-15 ha cm/ha) was saved in stand establishment. Sulfuric acid applied in bands reduced soil crusting. Soluble salts in the seed zone resulting from band application of sulfuric acid killed or damaged seedlings. Sulfuric acid when applied in irrigation water, to saline-sodic soils, improved plant growth and water use effiw75-11045

SCHEDULING AND APPLICATION RATES OF IRRIGATION IN A HUMID CLIMATE,

Alabama Agricultural Experiment Station, Auburn.

C. D. Busch, and E. W. Rochester. Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 760, \$3.75 in paper copy, \$2.25 in microfiche. Bulletin 470, Agricultural Experiment Station, Auburn University, June 1975. 38 p, 10 fig, 6 tab, 15 ref, 5 append. OWRT A-025-ALA(3).

Descriptors: Irrigation, *Rates of application, *Application methods, *Irrigation practice, *Humid climates, *Supplemental irrigation, Soil moisture, Water demand, Crop production, *Cotton, On site investigation

vestigation.

Identifiers: Simulation studies, Irrigation by demand. Irrigation scheduling.

A four-year study of two irrigation scheduling methods and application rates was conducted to determine more efficient uses of supplemental water in a humid climate. One model based on the decision to irrigate on weather forecast and soil moisture conditions; the other, irrigation by demand, based on soil moisture conditions only. Two application rates of 0.13 in/hr (low) and 0.43 or 0.7 in/hr (high) were used. A computer program was developed to calculate soil moisture and predict irrigation needs in the forest scheduling model. A 0.5 probability of rainfall greater than 0.5 inch was the low limit. The weather forecast also provided the basis of deciding how much rainfall would be included in the soil moisture balance. The inclusion of weather forecast was insignificant. However, irrigation in itself did improve yields. The method of irrigation by demand improved production 160 lbs. of seed cotton per acre for each inch of water applied. Simulation studies following the field experiment supported the results of the field study. In the associated application rate study the low application rate of 0.13 inches per hour was superior in cotton production and in the minimization of soil crust strength. The study also sug-gested that an exponential relation is appropriate for relating crust strength to crust moisture con-W75-11048

CONSOLIDATION AND REHABILITATION OF CANALS IN POUDRE VALLEY,

Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 4A. W75-11061

CULTIVATION OF NETTED MELON BY USE OF TRICKLE IRRIGATION IN A SAND FIELD PLASTIC GREENHOUSE, (IN JAPANESE), Tottori Univ. (Japan). Sand Dune Research Inst.

T. Cho, T. Yamamoto, and Y. Takeuchi. Sand Dune Research Institute, Bulletin No 14, p 1-8, March 1975 2 fig, 3 tab, 8 ref. English summary.

Descriptors: *Greenhouses, *Sands, *Irrigation, *Irrigation effects, Dunes, Sprinkler irrigation, Irrigation practices, Irrigation systems, Agronomic crops, Plant growth, Plastics, Fertilization, Application methods.

Identifiers: *Trickle irrigation, *Japan.

Two varieties of netted melon, Earls Favorite and Shinhoro, growing in plastic greenhouses in a sand field, were irrigated using the trickle irrigation method. Net fruit development and sugar content of Earls Favorite were greater using trickle irrigation than that obtained using sprinkler irrigation methods. Net development of the fruit of Shinhoro was greater on single vine plants than on two, three, or four vine plants. By examining and correlating nozzle flow rates, trickle times, and liquid fertilizer applications involved in trickle irrigation systems, new methods for netted melon cultivation may be developed. (Frondorf-Arizona) W75-11095

NOZZLE HYDRAULICS IN THE TRICKLE IR-RIGATION SYSTEM--RELATION BETWEEN WATER TEMPERATURE AND NOZZLE FLOW RATE (IN JAPANESE),

Tottori Univ. (Japan). Sand Dune Research Inst. T. Yamamoto, and H. Kawasaki.

Sand Dune Research Institute, Bulletin No 14, p 9-14, March 1975 7 fig, 2 tab, 3 ref. English summa-

Descriptors: *Irrigation, *Application methods, *Rates of application, *Flow rates, *Nozzles, Sprinkler irrigation, Irrigation practices, Irrigation systems, Pressure, Flow, Water temperature. Identifiers: *Trickle irrigation, *Japan.

The flow rate of the trickle nozzle which connects with the distribution pipe of a trickle irrigation system is dependent on pressure, water temperature, and the dimensions of the spiral flow path. The pressure and dimensions of the spiral flow path constant, nozzle flow rate varies with water temperature, which acts on the kinematic viscosity coefficient. A formula for the calculation of nozzle flow rate at any given temperature is presented. Calculated values are found to agree well with experimentally determined values. (Frondorf-Arizona)

PRACTICAL APPLICATION OF SURFACE FIXED-SYSTEM FOR MULTI-PURPOSE SPRIN-KLER IRRIGATION USES, (IN JAPANESE),

Tottori Univ. (Japan). Sand Dune Research Inst. T. Cho, T. Yamamoto, Y. Takeuchi, Y. Nomura, and M. Inoue.

Sand Dune Research Institute, Bulletin No 14, p 15-24, March 1975 7 fig, 6 tab, 4 ref. English summary.

Descriptors: *Irrigation, *Sprinkler irrigation, *Irrigation efficiency, *Distribution systems, *Application methods, Irrigation practices, Irrigation systems, Fertilizers, Pesticides, Fertilization. Identifiers: *Japan.

An investigation of the multiple uses of a surface fixed-system sprinkler irrigation system, including application of liquid fertilizers and pesticides was conducted. Uniformity coefficient and pattern eficiency of the sprinkler system were computed by measuring the height of water caught in cans. These two factors were then used to estimate the sprinkler distribution efficiency. Investigations of the ratio of wetting area of chemical spray to leaf area, for different sprinkler types and for different amounts of spray, were conducted on Dioscorea opposita (chinese yam) and Raphanus sativus (radish). It is concluded that the fixed-system is a feasible sprinkler irrigation method for multiple uses. (Frondorf-Arizona)
W75-11097

IMPROVING PRODUCTIVITY IN LOW RAINFALL AREAS, IN INDIA.

Food and Agriculture Organization of the United Nations, Rome (Italy).

Food and Agriculture Organization of the United Nations, Rome, Italy. COAG/74/4, Appendix 1, April, 1974. 16 p, 2 tab.

Descriptors: *Farm management, *Arid climates, *Land use, *Land management, *Dry farming, Productivity, Plant growth, Climatic zones, Dry seasons, Semiarid climates, Soil types, Soils, Land tenure, Groundwater, Rainfall, Infiltration, Runoff, Crop production, Education, Arid lands, Water utilization, Wells, Fertilizers, Planting management. Identifiers: *India.

A general overview is given of climate, soils, land and culture of areas in India where agricultural projects are under study. These 54 projects in low rainfall areas comprise 30 percent of India's cultivated land area. The study is aimed at determining the most efficient and non-wasteful use of water from wells and rainfall. Crop production techniques, crop varieties, use of fertilizers, planting and after care are examined. Animal husbandry works best in certain climatic and vegetative areas and can be improved through irrigation. Programs of agricultural extension, education, and a federal farm credit program have provided assistance to the participants in the projects. Tables are given on projects, crops grown, yields, and yield increases. The objectives, organization and staffing patterns of dryland research centers and integrated dryland development projects of India are described. (Miller-Arizona)

THE EFFECT OF IRRIGATION ON THE YIELD AND QUALITY OF MAINCROP POTATOES, L. W. Wellings.

Exp Husb, 24 p 54-69, 1973. Illus

Descriptors: *Irrigation, Crop production, *Potatoes, *Soil moisture. Identifiers: *Streptomyces-Scabies.

Irrigation significantly increased yield in 4 of the 6 experiments with large increases in 2 seasons. On average irrigation throughout the growing season when soil moisture deficit (S.M.D.) reached 55% of the available water capacity (A.W.C.) in the top 30 cm of soil, or irrigation when S.M.D. reached 160% A.W.C. for 4-6 wk after tuber initiation followed by irrigation when S.M.D. reached 100% A.W.C., tended to give higher yields than irrigation at S.M.D.'s of 100-140% A.W.C. after the tubers had reached a diameter of 10-20 mm. Irrigation in the subject of tubers by decreasing the level of common scab (Streptomyces scabies) and frequent irrigation for 4-6 wk from tuber initiation gave high yields of scab-free tubers from susceptible varieties. Results in 2 yr when there were large responses indicated that "Majestic' and "Record" need more frequent irrigation than "King Edward" and "Pentland Crown" to produce their best yields. The results are used to indicate a system of irrigation for commercial production of high quality potatoes from light land.—Copyright 1974, Biological Abstracts, Inc.

Control Of Water On The Surface—Group 4A

W75-11106

LAND AND WATER RESOURCES SURVEY IN THE JEBEL MARRA AREA, THE SUDAN.
Food and Agriculture Organization of the United Nations, Rome (Italy). For primary bibliographic entry see Field 4A. W75-11139

AVAILABLE WATER-HOLDING CAPACITIES OF SOILS IN SOUTHERN IDAHO.

Idaho Agricultural Experiment Station, Aberdeen, For primary bibliographic entry see Field 2G.

AN IMPLICIT APPROACH TO PRICING AGRICULTURAL WATER TRANSFERS TO

Colorado State Univ., Fort Collins. Dept. of

Agricultural Engineering. For primary bibliographic entry see Field 4A. W75-11178

GENERATION OF ARID ZONE RAINFALL AND RUNOFF,

University of New England, Armidale (Australia) School of Natural Resources. For primary bibliographic entry see Field 2A. W75-11303

THE ROLE OF ENDOGENOUS ARSCISIC ACID IN THE RESPONSE OF PLANTS TO STRESS, Royal Univ. of Malta, Valletta. Dept. of Chemis-

R. W. P. Hiron, and S. T. C. Wright. J Exp Bot. Vol 24, No 81, p 769-781, 1973, Illus.

Descriptors: *Plant physiology, *Beans, *Leaves, *Wilting, Dehydration, Stomata, Wheat, Rice, Flooding. Tomatoes.

Identifiers: *Abscisic acid. Glucose Lycopersicon-esculentum, Oryza-sativa, Phaseo-lus-vulgaris, Triticum-aestivum, *Turgor, *Warm

When a continuous stream of warm air (38C) was directed on to the leaves of dwarf bean (Phaseolus vulgaris) seedlings they wilted and then gradually regained turgor. This process of adaptation was accompanied by an increasing abscisic acid (ABA) level in the leaves and an increase in leaf resistance (RL). It is suggested that the leaf-water deficit induced by the warm-air treatment caused the increase in ABA level and that the latter was responsible for stimulating stomatal closure, enabling the plants to regain full turgor. A similar type of adaptation, brought about by an increased level of ABA in the leaves, is believed to occur in tomato (Lycopersicon esculentum), dwarf bean, and wheat (Triticum aestivum) plants when they are flooded. Predictably, in rice (Oryza sativa), a species adapted to a flooded environment, seedlings showed no increase in ABA level as a result of flooding. Adaptation may involve the formation of an equilibrium between ABA and its conjugate form (i.e. the glucose ester). The ABAconjugate was observed to disperse slowly from leaves recovering from a water deficit; and therefore it may act as a metabolic 'back-stop,' enabling the 'free' ABA to remain high for a period even when the leaves have regained turgor. Abscisic acid appears to be responsible for alleviating the effects of water stress in plants, making it possible for plants to pass through periods of stress with little harm .-- Copyright 1974, Biological Abstracts, Inc. W75-11319

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

COVARIANCE ANALYSIS OF RESERVOIR DEVELOPMENT EFFECTS ON PROPERTY TAX BASE

Kentucky Water Resources Inst., Lexington. For primary bibliographic entry see Field 6B. W75-10851

SOCIAL IMPACTS OF WATER RESOURCES DEVELOPMENTS AND THEIR IMPLICATION FOR URBAN AND RURAL DEVELOPMENT: A POST AUDIT ANALYSIS OF THE WEBER BASIN PROJECT IN UTAH,

Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources. For primary bibliographic entry see Field 6B. W75-10854

DIFFERENTIAL RELEASE OF WATER FROM ARIZONA SNOWPACKS, Arizona Univ., Tucson. Dept. of Watershed

Management. For primary bibliographic entry see Field 2C. W75-10860

INTERNATIONAL DEVELOPMENT STRATE-GIES FOR THE SAHEL.

Rockfeller Foundation Report, May 1975. 50 p. 3 fig, 14 ref. Conference held at Bellagio, Italy, Oc-

Descriptors: *Regional development, *Droughts, *Weather patterns, *River basin development, Water management(Applied), Administration, Research and development. Transportation, Education, Population, Livestock, Carrying capacity, Limiting factors, Arid lands, Environmental effects, *Africa.

Identifiers: *Sahelian zone, Nomadism.

This conference was devoted to an examination of the needs for achievement of long-term development of the Sahel, establishment of priorities, and means for implementation. Interest focussed on the existing Comite' Inter-Etats de Lutte Contre la Secheresse as Sahel (CILSS). Its programs based on participation by Chad, Gambis, Mali, Mauritania, Niger, Senegal, and Upper Volta, include a regional study of water management, including river basin development; transport and communications; improvement of genetic stock; reforestation; and a special development fund. The con-ference recommended the following strategies: (1) Infrastructure development, emphasizing road and water basin development, (2) improved participa-tion of local people, including mass communications and education to help the people cope with their own needs, (3) long-term development, (4) resource management, (5) bringing nomadic life into better balance with the carrying capacity of the land and the availability of renewable and nonrenewable resources, (6) establishment of a regional Sahelian Institute to aid in research and development by catalyzing and mobilizing resources in the long term to bring about an improvement in the quality of life for its people. The recent drought, degradation of the environment throughout the region, and a recognition of the differences between emergency relief and long-term local management of what was acknowledged as a recurring phenomenon were additional topics for discussion. Summaries are included of papers on Weather and Climate in the Sahel, and Environmental Management. (Paylore-Arizona) W75-10861

SHRUB TRANSPLANTING FOR WATERSHED MANAGEMENT AND RANGE IMPROVEMENT

Univ., Tucson. Dept. of Watershed Arizona Management. For primary bibliographic entry see Field 4D. W75-10870

THE INFLUENCE OF RAINFALL ON THE REPRODUCTION OF SONORAN DESERT

LAGOMORPHS, Arizona Univ., Tucson. Dept. of Biological Sciences. R. L. Madsen.

Arizona University, Tucson, Department of Biological Sciences, MS Thesis, 1974. 60 p. 11 fig. 5 tab, 4 append, 15 ref.

Descriptors: *Herbivores, *Competition. *Rainfall, *Rainfall intensity, *Arizona, *Range management, Arid climates, Semiarid climates, Mammals, Small animals(Mammals), Wildlife. *Competition. Wildlife. Grazing, Moisture deficit, Reproduction.
Identifiers: *Avra Valley(Ariz), *Lagomorphs.

Lagomorphs have long been recognized as impor-tant herbivores in the Sonoran desert. They are the chief competitors with cattle for the sparse grazing and available water in the southwest. Their size and mobility increase the effect they can have on their habitat. During the period of March 1971 to December 1973 lagomorphs were collected from Avra Valley, Arizona. Reproduction activity was highest during January-March and again in July-August. This roughly corresponds with the rainy seasons of the Sonoran Desert. The variance of rainfall during this period corresponded with the decline and rise in the lagomorphs' population. Lack of rainfall often caused high mortality rates or forced migration, while normal rainfall increased the population and competition for grazing and water. (McLachlan-Arizona)

INTERBASIN WATER TRANSFERS: A CASE STUDY IN MEXICO.

Resources for the Future, Inc., Washington, D.C. R. G. Cummings. Distributed by The John Hopkins University

Press, Baltimore, Md 1974 114 p.

Descriptors: "Inter-basin transfers, "Water transfer, "Water resources development, "Mexico, Imported water, Mexican water treaty, Economic impact, Economic justification, Mathematical models, Equations, Model studies, Urban sociology, Rural sociology, Cost-benefit analysis, Groundwater, Groundwater mining, Water table, Pumping, Project planning, Project benefits, Pro-

ject purposes, Planning. Identifiers: Northwest Water Plan, Yaqui Valley(Mexico), Costa de Hermosillo(Mexico).

The state of interbasin water transfers in Mexico is explained with detailed description of the current horthwest Project, including the project's concep-tual structure and implied directions. A model which gives patterns of water transfer is evaluated for a representative year, treated parametrically from optimum pumping levels and optimal rates of pumping in the Costa de Hermosillo area. Results are applied to projections for interbasin water transfer developments. Net benefits from and costs of the water are examined in light of economic relations between the rural and urban sectors in the study region. An analysis of representative year transfers is presented and the optimum intertemporal exploitation of the Costa Aquifer is discussed. Conclusions are presented and discussed. (Miller-Arizona) W75-10879

ESTABLISHING ALKALI SACATON ON HARSH SITES IN THE SOUTHWEST,

Forest Service, (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

E. F. Aldon

Journal of Range Management, Vol 28, No 2, p 129-132, March 1975, 2 fig, 2 tab, 14 ref.

Descriptors: *Grasses, *Vegetation establishment, "Seed treatment, "Soil moisture, "Germination, "Reproduction, Viability, Mulching, "New Mex-ico, Range management, Southwest US. Identifiers: "Alkali sacaton.

Despite previous unsuccessful trials in planting alkali sacaton (Sporobolus airoides (Torr.) Torr) on badly eroded sites in flood plains in the semi desert of the Southwest, experiments conducted under field conditions on the Rio Puerco drainage of northwestern New Mexico proved that this grass can be grown successfully under exacting conditions: (1) plant when soil moisture is at least 14 percent or higher (1 atm tension or less), (2) plant when probabilities for weekly precipitation are greater and soil temperatures will be near 30 degrees C, (3) use large seeds at least 1 year old, (4) saturate the planting site just prior to planting, (5) cover seeds with about 13 mm of mulch to keep them moist and dark, and (6) if storms at planting site do not deposit at least 6 mm of rain within the first 5 days, rewater to bring the soil to saturation. If properly manages, alkali sacaton provides valuable forage and can effectively lower sediment losses. Management steps, outlined above, are based on results that show maximum conditions for survival, taking advantage of summer precipitation when seeds are mature, and the ability of seeds to emerge through as much as 4 cm of sediment deposited during runoff from sudden summer thunderstorms. (Paylore-Arizona) W75-10882

STABILIZATION AND RECONSTRUCTION OF TEXAS COASTAL FOREDUNES WITH VEGETATION,

Texas Tech Univ., Lubbock For primary bibliographic entry see Field 2L. W75-10887

PRODUCTS FROM JOJOBA: A PROMISING NEW CROP FOR ARID LANDS

National Research Council, Washington, D.C. Committee on Jojoba Utilization. For primary bibliographic entry see Field 3F. W75-10890

APPROXIMATE ANNUAL WATER BUDGETS OF TWO CHAINED PINYON-JUNIPER SITES, Utah State Univ., Logan. Watershed Science Unit. G. S. Gifford

Journal of Range Management, Vol 28, No 1, p 73-74, January 1975. 1 tab, 5 ref.

Descriptors: *Water balance, *Runoff, *Interception, *Vegetation effects, Soil moisture, Pinyon pine trees, Juniper trees, *Utah, Rainfall, Semiarid climates, Hydrologic budget. Precipitation, Identifiers: Chaining

Two chained pinyon-juniper sites in Utah were studied to obtain an approximate water balance for each of these treatments at each site: natural woodland, chaining-with-debris-in-place, and chaining-with windrowing. Results indicate that most of the annual precipitation falling on each treatment is lost through evapotranspiration, with much of the remainder being lost through interception. When runoff did occur, it was greatest from the windrowed treatments and least from the debris-in-place treatments. The range of annual rainfall for the two sites was about 8 to 11.5 inches. Deep seepage was zero in all cases. (Mastic-Arizona) W75-10896

THE LAW OF WATER ALLOCATION IN KEN-TUCKY, Kentucky Water Resources Inst., Lexington.

For primary bibliographic entry see Field 6E. W75-10898

TWO-DIMENSIONAL, HYDROSTATIC SIMU-LATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS,

Stanford Univ., Calif. Dept. of Civil Engineering. For primary bibliographic entry see Field 2H. W75-10901

FLOOD RUNOFF FROM URBAN AREAS, Maryland Univ., College Park. Dept. of Civil Engineering.

For primary bibliographic entry see Field 5B. W75-10904

ENVIRONMENTAL IMPACT EVALUATION IN FRESHWATER IMPOUNDMENTS BY VEGETATION ANALYSIS OF THE TER-RESTRIAL ECOSYSTEM,

Massachusetts Univ., Amherst. Water Resources Research Center.

For primary bibliographic entry see Field 2I. W75-10905

THERMAL RESPONSE OF HEATED STREAMS, SOLUTION BY THE IMPLICIT METHOD.

Iowa Univ., Iowa City. Inst. of Hydraulic Research.

For primary bibliographic entry see Field 5B. W75-10909

AUTOMATED DISTRIBUTION OF GAUGE AND SHIFT CORRECTIONS,

Department of the Environment, Ottawa (Ontario). Water Resources Branch. For primary bibliographic entry see Field 7C. W75-10911

AUTOMATED TIDAL COMPUTATIONS, Department of the Environment, (Ontario). Water Resources Branch. For primary bibliographic entry see Field 7C. W75-10912

FLOW FILE OPERATIONS MANUAL, Ottawa Department of the Environment, (Ontario). Water Resources Branch. For primary bibliographic entry see Field 7C. W75-10913

AUTOMATED HOURLY COMPUTATIONS, Department of the Environment, (Ontario). Water Resources Branch. Ottawa For primary bibliographic entry see Field 7C. W75-10915

PREDICTING RECESSIONS THROUGH CON-

VOLUTION, Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center. For primary bibliographic entry see Field 2E. W75-10917

WIND EFFECTS ON CHEMICAL FILMS FOR EVAPORATION SUPPRESSION AT LAKE HEFNER.

Agricultural Engineering. For primary bibliographic entry see Field 3B. W75-10920 Oklahoma State Univ., Stillwater. Dept. of

SUBSURFACE FLOW FROM SNOWMELT TRACED BY TRITIUM,

Swiss Federal Inst. for Snow and Avalanche Research, Davos-Weissfluhjoch. For primary bibliographic entry see Field 2F.

W75-10921

IMPORTANCE OF DECISION VARIABLES IN FLOOD FREQUENCY ANALY-

IBM Watson Research Center, Yorktown Heights,

J. R. Wallis, and N. C. Matalas.

In: Proceedings of Symposium on the Design of Water Resources Projects with Inadequate Data, Volume 1; Madrid, June 1973, sponsored by UNESCO-WMO-IAHS: Comite Espanol para el D H I, p 435-442, 1973. 9 tab, 1 ref.

Descriptors: *Probability, *Monte Carlo method, *Flood frequency, Simulation analysis, Statistical models, Decision making, Flood control.

Monte Carlo simulations were used to assess flood and overdesign losses that result from differing choices of assumed frequency distribution, plotting position, criterion of best fit and length of record. The probability of the event that a sequence, having a particular element of the real world set as its underlying distribution, is best fitted by a particular element of imagined world set, relative to a particular method of assigning exceedance probabilities and a particular criterion of best fit, was estimated by N/18,000, where N denotes the number of times the event occurred and 18,000, the total number of times the event could have occurred. (Knapp-USGS) W75-10929

STREAMFLOW IN THE NEW YORK PART OF THE SUSQUEHANNA RIVER BASIN,

Geological Survey, Albany, N.Y For primary bibliographic entry see Field 2E. W75-10931

ESTIMATED AVAILABILITY OF SURFACE AND GROUND WATER IN THE POJOAQUE RIVER DRAINAGE BASIN, SANTA FE COUN-TY, NEW MEXICO.

Geological Survey, Albuquerque, N. Mex. L. J. Reiland, and F. C. Koopman. Open-file report 74-151, June 1975. 35 p, 2 fig, 8 tab, 3 ref.

Descriptors: Water resources. Groundwater resources, *Hydrologic data, *New Mexico, Water measurement, Discharge(Water), Water yield, Water wells, Withdrawal, Aquifer characteristics, Water levels, Drawdown, Regres-

sion analysis.
Identifiers: *Santa Fe County(N Mex), Pojoaque River basin(N Mex).

The natural flow is computed for the Pojoaque River at several points along its course in Santa Fe County, N. Mex., on a monthly basis for the period 1935-72. The recorded flow is tabulated for the Rio Grande at Otowi gaging station on a monthly basis for the period 1935-72. Computa-tions were made to determine the volume of groundwater that could be withdrawn from the Pojoaque River drainage basin, assuming drainage of the aquifer was to depths of 500, 1,000, and 1,500 feet. The results indicate that 3,300,000 acrefeet of water could be withdrawn by draining the aquifer to a depth of 500 feet; 9,500,000 by draining the aquifer to a depth of 1,000 feet; and 14,900,000 by draining the aquifer to a depth of 1,500 feet. (Woodard-USGS) W75-10938

LOW-FLOW CHARACTERISTICS SELECTED STREAMS IN NORTHEASTERN

WASHINGTON, Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 2E. W75-10939

WATER QUANTITY MANAGEMENT AND CONTROL-Field 4

Control Of Water On The Surface—Group 4A

ESTIMATED MEAN-MONTHLY AND ANNUAL RUNOFF AT SELECTED SITES IN THE POJOAQUE RIVER DRAINAGE BASIN, SANTA FE COUNTY, NEW MEXICO,

Geological Survey, Albuquerque, N. Mex For primary bibliographic entry see Field 2E. W75-10943

HIERARCHIAL HIERARCHIAL MODEL FOR SUPPLY-SYSTEM CONTROL, WATER-

Cambridge Univ. (England). Dept. of Engineering. F. Fallside, and P. F. Perry.

Proceedings of the Institution of Electrical Engineers, Vol 122, No 4, p 441-443, April 1975. 4 fig. 1 tab, 11 ref.

Descriptors: Analytical techniques, *Water supply, *Model studies, *Computers, *Control systems, Telemetry, Forecasting, Simulation anal-vsis. *Computer models, *Water distribution(Applied) Identifiers: Hierarchical computer models

A collaborative university-industry research project is being conducted for the introduction of an online computer control system for a water supply network in the United Kingdom. Aspects of the problem of water distribution include modelling and simulation, consumption forecasting, waste detection, and optimal control. Each can be considered as a set of interacting subproblems, within which control effort is subdivided into a hierarchy of control function of ascending complexity. The scheme provides a framework for overall control of the network including optimal pumping control, short term demand forecasting and anomalousload detection, each to be performed online on a central computer and implemented at the plant by a telemetry scheme. Details of each layer of control is described and proposed implementation via linked computers is discussed. The multilayer concept of control includes control activities associated with a regulator layer, an optimizing layer, an adaptive layer to compensate for disturbances or model induced errors, and a selforganizing control function, which gives feedback on the control-system design. (Prague-FIRL) W75-10996

COST EVALUATION OF WATERCOURSE MANAGEMENT IN ESSEX, Cambridge Univ. (England). Dept. of Applied

Biology. For primary bibliographic entry see Field 5G. W75-11008

FRESHWATER ECOSYSTEM RESEARCH IN WATER QUALITY MANAGEMENT. Rensselaer Polytechnic Inst., Troy, N.Y. Fresh

Water Inst. For primary bibliographic entry see Field 6G. W75-11012

AN ASSESSMENT OF SNOWPACK DEPLE-TION-SURFACE RUNOFF RELATIONSHIPS ON FORESTED WATERSHEDS, Arizona Univ., Tucson. School of Renewable

Natural Resources

P. F. Ffolliott, and D. B. Thorud.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 697, \$3.25 in paper copy, \$2.25 in microfiche. Completion Report, August 1975. 4 p, 5 ref. OWRT A-045-ARIZ(3). 14-31-001-5003.

Descriptors: *Snowmelt, *Forest watersheds, *Computer models, *Simulation analysis, *Water sources, *Arizona, Forest management, Runoff, Watershed management, Water supply, Small watersheds, Forecasting. Identifiers: *Snowmelt runoff, *Forest manage-

ment guidelines, New water supply.

A technique was developed for determining daily values of snowmelt runoff efficiencies (i.e., the portion of a snowpack that is converted into recoverable water) from small forested watersheds by coupling a computer program that stimulates Arizona snowmelt processes with graphical procedures of runoff hydrograph separation. Employing this technique, seven watersheds with 14 years of record were used in evaluating changing patterns of snowmelt runoff efficiences within a year. Additionally, an array of physical, biological, and climatic variables were empirically correlated with snowmelt runoff efficiencies to identify the factors affecting efficiencies both within and among snowmelt-runoff seasons. Inventory-prediction equations were also formulated for use in the stratification of high water-yielding watershed source areas. W75-11049

MOISTURE AND ENERGY CONDITIONS IN A DRAINING SOIL MASS,

Georgia Univ., Athens. School of Forest Resources. For primary bibliographic entry see Field 2G. W75-11054

PRESCRIPTIVE ECONOMIC MODELS FOR NONSTRUCTURAL FLOOD CONTROL, Cornell Univ., Ithaca, N.Y. For primary bibliographic entry see Field 6F.

W75-11060

CONSOLIDATION AND REHABILITATION OF

CANALS IN POUDRE VALLEY,
Colorado State Univ., Fort Collins. Dept. of
Agricultural Engineering.

Available from the National Technical Informa Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 727, \$5.75 in paper copy, \$2.25 in microfiche. AER 73-74CFL-2, November 1973. 121 p, 20 fig, 15 tab, 9 ref. OWRT B-083-COLO(9). 14-31-0001-3867.

*Irrigation, *Water ment(Applied), *Canals, *Colorado, Land resources, Land use, Water balance, Water rights, Rehabilitation, Consolidation, Irrigation canals, Canal linings, Canal seepage, Hydraulic struc-tures, Agriculture, Urbanization, Water distribu-tion(Applied), Water supply, Water shortage, Water transfer.

Identifiers: *Poudre Valley(Col).

The advantages and disadvantages of consolidating certain canals south of Cache la Poudre River were explored. Field investigations were reported regarding the rehabilitation of canals and laterals north of the Cache la Poudre River. The engineering costs and expected water savings of such im-provements were explored. The land served by the canals on the south-side of the Cache la Poudre River are rapidly being developed. As land is taken out of production, the irrigation water for that land is sold out of the canal and to the city. This causes a greater percentage of the remaining water in the canal to be lost to seepage. The only feasible canal consolidation proposal for the south-side canals is to consolidate all four canals into the Pleasant Valley and Lake Canal. The only feasible canal lining program would appear to be the high seepage loss sections in the North Poudre Canal and Larimer County Canal. Lining the entire length of the North Poudre Canal would alleviate present water shortages in that system except for a few dry years. (Sims-ISWS) W75-11061

COMPARISON OF UREDO EICHHORNIAE, THE WATERHYACINTH RUST, AND URO-MYCES PONTEDERIAE, Florida Univ., Gainesville. Dept. of Plant Patholo-

For primary bibliographic entry see Field 5G. W75-11092

STUDIES ON THE RELATIONSHIP BETWEEN DRY-MATTER PRODUCTION AND THE DEVELOPMENT OF A PINE FOREST ON COASTAL SAND DUNES (1), (IN JAPANESE), Tottori Univ. (Japan). Dept. of Forestry Manage-

R. Ogasawara, M. Hikichi, K. Tsuboi, S Kinoshita, and Z. Shibayama.

Sand Dune Research Institute, Bulletin No 14, p 25-32, March 1975 4 fig, 4 tab, 14 ref. English sum-

Descriptors: *Trees, *Pine trees, *Sands, *Dunes, *Growth rates, Mass, Dimensions, Size, Biomass, Height, Weight, Nitrogen, Phosphorus, Height. Chlorophyll, Carbohydrates, Moisture content,

Identifiers: *Japan, Basal area, Stems, Auxins

Basal area at breast height of pine trees increases with increasing tree height. Total mass and total increment of trees, as well as the ratio of stem biomass and increment, increased with tree height increase. Net assimilation rate tended to increase with increase in tree height, while leaf weight ratio tended to decrease. Total nitrogen, phosphorus, chlorophyll, and water contents increased while auxins, total carbohydrate, and carbohydrate to nitrogen ratio decreased with increasing tree height. Number of fallen leaves on the ground, as well as the total nitrogen, total phosphorus, and water contents of the fallen leaves, increased with increasing tree height. (Frondorf-Arizona) W75-11098

IMPROVING PRODUCTIVITY IN LOW RAIN-FALL AREAS, IN INDIA.

Food and Agriculture Organization of the United Nations, Rome (Italy). For primary bibliographic entry see Field 3F.

W75-11099

COULD THE SEA BE USED TO STORE WATER FOR SUPPLY ... A POSSIBLE SCHEME.

G. H. Mortimer. Water Services, Vol 29, No 949, p 98-103, March 1975. 6 fig. 1 tab. 5 ref.

Descriptors: *Reservoirs, *Reservoir sites, *Water storage, Reservoir storage, *Water supply, Storage capacity, Routing, Dependable supply. Identifiers: *Underseas water storage.

Due to the objections of an environmentally conscious public to the construction of large inland water reservoirs, a water storage scheme is proposed which may resolve this problem and could also make more efficient use of the rivers as sources of water supply. This system involves tak-ing water from a river above the tidal limit and pumping it to a flow balancing tank located on the coast. Two pipes are connected into this tank, one carrying water to a supply and the other leading to the flexible bags situated on the seabed a few miles offshore. The works have been divided into three parts: works at the river abstraction point (including the initial water treatment); the flow balancing tank; and, the bags. The advantages of an underseas storage scheme include: since no countryside is lost through flooding, undersea storage should be more readily acceptable to the general public; it allows a more efficient use of rivers as sources of water supply than at present; some degree of economic flexibility is inherent since by adding more bags to the system the yield can be increased to meet demand; and there are a large number of possible sites around the coastline of Great Britain conveniently close to cities such as Teesside, Newcastle, London, and Hull. The main disadvantage is that underwater storage has a greater chance of an accident occurring which will cause a failure of supply than does inland storage. (Orr-FIRL)

Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

LAND AND WATER RESOURCES SURVEY IN THE JEBEL MARRA AREA, THE SUDAN

Food and Agriculture Organization of the United Nations, Rome (Italy)

Final Report FAO/SF:48/SUD-17, 1968. 72 p, 14 fig, 15 tab, 7 maps, 5 append.

Descriptors: *Land resources, *Water resources, *Surveys, *Maps, Population, Geology, Soil surveys, Land classification, Vegetation, Land use, Water resources development, Agriculture. Forestry, Communication, Railr struction, Industries, Economics. Communication, Railroads, Road con-Identifiers: *Jebel Marra Area(Sudan), *Sudan

This report described the first phase of a project under the United Nations Development Programme to assist the Government of the Sudan to obtain technical data on which to base plans for the agricultural development of the Jebel Marra and Wadi Azum areas of the Darfur province. The Government's policy is to broaden the basis of the national economy by geographical dispersal of development activities and crop diversification in agricultural areas. Field operations were carried out from 1963 to 1967. An inventory of basic land and water resources was made and economic studies were carried out. The scope of the introducing more advanced agricultural techniques was examined, together with the social and economic factors involved. The foundation for a follow-up project to support experimental agricultural development was laid. It was recommended that the project be continued with a shift in emphasis from a survey of resources to agricultural development demonstration. The main emphasis should be placed on the production of high gross-value crops which are particularly adapted to the climate and soils of the project area, and which either have to be imported or are only seasonally available. The theme of the report would be extension work among the farmers, to introduce better cultural practices and varieties of crops, and the use of fertilizers and irrigation water. Since pumping from the underground waters of the terrace lands of the Wadi Azum provides the major irrigation possibilities, increased attention should be given to pilot stations and farmer demonstrations of irrigated crops there. (Sims-ISWS) W75-11139

HYDROLOGIC INVESTIGATION AND DESIGN STORMWATER URBAN DRAINAGE

Snowy Mountains Engineering Corp., Canberra (Australia).

A. P. Aitken

Australian Water Resources Council Technical aper No 10, Vol 1, 1975, 140 p, 14 fig, 17 tab, 63 ref. append.

Descriptors: *Urban hydrology, *Urban drainage, *Australia, *Rainfall-runoff relationships, *Australia, *Rainfall-runoii icanalysis,
*Mathematical models, *Simulation analysis,

Parional formula, Drainage runoff, Rational formula, sy ems, Hydrographs, Hydrologic data, Hydrology, Routing, Storm runoff, Hydraulic systems, Storm drains, Design, Water quality. Identifiers: Rainfall-runoff data, Model evalua-

tion, Drainage design techniques.

A comprehensive report dealt with urban hydrology in Australia. Existing sources of urban rainfallrunoff data in Australia were examined in considerable detail. Specific basins were examined and the kinds of available data were discussed. The Rational Method, the Road Research Laboratory Method, the Modified Road Research Laboratory Method, and Laurenson's Runoff Routing Model were described and evaluated. An earlier evaluation of 8 other mathematical simulation models was summarized and these models compared. Consideration was given to water quality aspects of urban drainage and the types of qualidata available. (Terstriep-ISWS) W75-11141

EFFECTS OF ENTRANCE LOSS ON HARBOR OSCILLATIONS,

Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering For primary bibliographic entry see Field 8B. W75-11147

THE DESIGN OF STORM WATER DRAINAGE CHANNELS USING MATHEMATICAL MODEL

TECHNIQUES, Hydraulics Research Station, (England). For primary bibliographic entry see Field 8B. W75-11150

A STUDY OF FACTORS CONTROLLING THE CHEMICAL QUALITY OF WATER IN CART-WRIGHT CREEK COUNTY, TENNESSEE BASIN, WILLIAMSON Vanderbilt Univ., Nashville, Tenn. Dept. of

Geology. For primary bibliographic entry see Field 2K.

W75-11164

RESOURCES

COMPUTER SYSTEMS AND WATER

Polytechnic Institute of New York, Brooklyn; and Illinois Univ., Chicago. For primary bibliographic entry see Field 6A. W75-11174

IMPROVED DESIGN OF DISTRIBUTION NET-WORKS BY MINIMUM ROUTE,

Nihon Suido Consultants Co., Tokyo (Japan). S. Nakajima

Journal of the American Water Works Association, Vol 67, No 7, p 390-395, July 1975. 6 fig, 3 tab, 9 equ, 9 ref.

*Water distribution(Applied), Descriptors: *Alternative planning, *Design, *Networks. *Pipes, Construction costs, Size, Head loss, Flow, Pressure, Methodology, Operations research, Computers, Junctions, Economics, Equations, Hydraulics, Hydraulic gradient, Optimization, Distribution systems.

Identifiers: *Minimum-route method, Least-cost, Pipe diameter, Connecting pipe, Transportation theory, Branched pattern, Gridiron pattern

When designing a workable water-distribution network, three conditions should be considered: water-pressure distribution, flow distribution, and engineering economy. Any attempt to improve the design of a network primarily constitutes determining the pipe diameters that minimize total network construction cost while meeting hydraulic requirements. Described is a simple procedure to design an improved water-distribution network using market-ready pipe, applying minimum-route network-planning techniques. Considered is a net-work of fixed pipe routes, as a pipe network is governed mainly by the network of streets. An improved network is assumed whereby the allowable minimum hydraulic head is maintained at all outlets while minimizing construction costs of the network. Minimum routes to all outlets are selected and designed for market-ready pipe sizes that satisfy the theoretical, economical hydraulic gradient. An example network of a city is simplified to eliminate junctions for which the number of pipes entering the junction is fewer than three. For a basic branching system, use of the minimum route technique produces an economical pipe diameter of standard market size on the basis of most economical theoretical hydraulic gradient along each minimum route. Piping cost is 18.7% less using this method than with conventional method. (Bell-Cornell)

AN IMPLICIT APPROACH TO PRICING AGRICULTURAL WATER TRANSFERS TO

URBAN USES, Colorado State Univ., Fort Collins. Dept. of

Agricultural Engineering. W. R. Walker, and G. V. Skogerboe.

Water Resources Bulletin, Vol 11, No 4, p 751-758, August 1975. 6 fig, 6 ref.

Descriptors: "Agriculture, "Water transfer, "Pricing, Urbanization, Optimization, Alternative costs, Water quality, Standards, Management, Al-gorithms, Water supply, Water distribu-tion(Applied), Waste water treatment, Mathemati-cal models, Systems analysis, Water values. Identifiers: "Nonlinear programming, "Urban water systems, "Urban water use. *Agriculture, *Water Descriptors:

The increased agricultural efficiency of the American farmer has been a substantial impetus to the nation's rapid urbanization. In many western regions where total water supplies are limited, urbanization has required the transfer of heretofore agricultural water rights to the urban use. A major problem in such transfers has been the value or price of the water. A management level nonlinear programming model of a typical urban water system has been developed to find least-cost water supply, distribution, and wastewater treatment alternatives. The values of agricultural transfers were determined as the cost advantages of increas ing allowable reuse levels of urban effluents which imply the use of a downstream right. This procedure is justified by the economic theory of alternative cost. Results for a test application to the Denver, Colorado area indicate values on the order of \$1,000 per acre-foot of transferable water depending on effluent water quality restrictions and operational policies. (Bell-Cornell) W75-11178

DISTRIBUTION-SYSTEM OPERATION ANAL-YSIS MODEL,

Omaha Metropolitan Utilities District, Nebr. Services Dept. For primary bibliographic entry see Field 5D. W75-11180

COMPUTER ANALYSIS OF WATER-DIS-TRIBUTION SYSTEMS,

Springfield Dept. of Water, Light and Power, Ill.
P. Bonansinga Bonansinga.

Journal American Water Works Association, Vol 67, No 7, p 347-350, July 1975. 4 fig.

*Water Descriptors: distribution(Applied), Pescriptors: Water distribution Application (Proposition of Computer programs, Flow, Costs, Networks, Pumps, *Computers, Data collections, Design, Optimization, Mathematical models, Systems analysis, Distribution systems. Identifiers: Flow chart, Hardy Cross method

Utilizing its speed, a properly programmed computer can solve mathematical models and equations with a higher degree of accuracy than noncomputerized methods, making the digital computer an effective tool for solving water-distribution flow problems. This is illustrated by comparing the performance of computer analysis and of manual solution by the Hardy Cross method. Besides being more accurate, computer analysis is more economical. Considered are the problems in developing a computer program, i.e., writing a program in-house or purchasing a program, and costs. A flow chart is given showing a distributionsystem analytical program operating within a typical data collection system. Auxiliary programs can and should be written by the user. A brief description is given of the following programs: update from distribution system; growth projection; dis-tribution-system data; billing master; and water-system load data. Considered are the computer as design tool and computer optimization. Computer programs can store tremendous amounts of data and can actually eliminate erroneous data. The computer is ideal for deriving the optimal

design since it can consider many alternatives in a short period of time. A sample program demon strates use of the computer to evaluate the performance of various system designs. In conclusion, the disadvantages and advantages of compu-terization are listed. (Bell-Cornell) W75-11182

of

51.

er.

ve Al-

ti

he e-

re

0

ar er

ıl

of

ADVANCED TECHNIQUES IN THE MATHE-MATICAL MODELING OF WATER-DISTRIBU-

MATICAL MODELING OF WATER-DISTAINTION SYSTEMS,
Beck (R. W.) and Associates, Seattle, Wash.
S. M. Alexander, N. L. Glenn, and D. W. Bird. Journal of the American Water Works Association, Vol 67, No 7, p 343-346, July 1975. 2 fig.

*Water Descriptors: *Water distribution(Applied), *Networks, *Simulation analysis, *Computer programs, *Operations, *Analytical techniques, Control, Decision making, Planning, Design, Hazen-williams equation, Hydraulics, Reservoirs, Management, Mathematical models, Systems analysis, Distribution systems.

Identifiers: Physical data, Operational data, Hardy Cross method, Booster pumps, Source pumps,

Described is a network analysis program which is a state-of-the-art tool for the planning and design of water-distribution systems. Entire systems, regardless of size and complexity, can be modeled. The general-purpose program considered herein incorporates all the features found in a modern water-distribution system and accurately simulates the operation of each component. It provides a complete package that can be used as the basis for major decisions regarding existing system operation, future system development, and operational control. Discussed is computer application of mathematical modeling to water-distribution systems, which can lead to improved system operation. Modeling uses, such as evaluating capa-bilities of an existing system under anticipated water demands, are listed. Considered are the physical and operational system characteristics. Newton's direct method and the Hardy Cross iterative technique are evaluated. The general-purpose network analysis program uses the Hardy Cross method for computing the head losses and flows and the Hazen-Williams formula for describing the head loss versus flow relationship. Discussed are water system features (i.e., source pumps), initial flows, pressure, and hydraulic grade line, analytical and graphical output, updating of data, economic analysis, diagnostics, and program application. (Bell-Cornell) W75-11183

DISTRIBUTION-SYSTEM MACROSCOPIC MODELING,

General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div

R. DeMoyer, Jr., and L. B. Horwitz.
Journal of the American Water Works Association, Vol 67, No 7, p 377-380, July 1975. 3 fig, 3 tab, 17 equ, 9 ref.

Descriptors: *Water distribution(Applied), *Control, Networks, Mathematical models, Statistical models, Hydraulics, Regression analysis, Pumps, Pipes, Flow, Simulation analysis, Design, Algorithms, Equations, Operations Design, Algorithms, Equations, Operations research, Management, Model studies, Distribu-

tion systems.
Identifiers: Macroscopic model, Operating data,
Tanks, Head drop.

Presented is a derivation of a regression algorithm developed previously by Gilman et al as an alternative to conventional means for modeling water-distribution systems. The statistical model developed herein is macroscopic, as it deals only with major heads and flows associated with pumps and tanks. Given are the drawbacks of using a microscopic, or full network, model for purposes of control. The macroscopic model, designed to overcome these limitations, has great speed of solution and accuracy and is kept very up-to-date; it obtains its parameters from continual analysis of operating data, obtains the major heads and flows by a noniterative process, and functions without takeoff assumptions. The model has been developed for a system having only partial information available because of the stochastic nature of customer demand and the constant change in hydraulic network characteristics. The validation procedure shows that the macroscopic model is able to reproduce actual operating data accurately in a two-pump station, two-tank distribution system. It is found to be the exact equivalent of a full network model subjected to proportional loads in a day-long simulation. However, since the accuracy of the macroscopic model will decrease in a district having large nonproportional industrial loads, a full network model should replicate such a district better. (Bell-Cornell)

FINITE-ELEMENT METHOD FOR WATER-DISTRIBUTION NETWORKS,

AC1 Environics, Melbourne (Australia). A. G. Collins, and R. L. Johnson. Journal of the American Water Works Association, Vol 67, No 7, p 385-389, July 1975. 5 fig, 34

*Water distribution(Applied). Descriptors: *Networks, *Finite element analysis, *Pipes, Equations, Algorithms, Numerical analysis, Structural analysis, Pipe flow, Head loss, Hydraulics, Computer programs, Temperature, Effects, Hazen-Williams equation, Systems analysis, Methodology, *Distribution systems. Identifiers: Hardy Cross method.

The finite-element method has been increasingly used in a variety of engineering fields, including structural analysis. The equivalence of structural systems and pipe networks has long been recognized. The specific pipe-network problem may be defined using the finite-element approach, but since the system of equations for structural problems is normally linear, actual solution is difficult due to the nonlinear constitutive equations relating the flow and head loss. Herein, a computational algorithm derives the unique solution for an easily solved linear system equivalent to the true nonlinear system for pipe networks. The successful application of the finite-element method to pipe-network problems shows that the method is not only superior to conventional Hardy Cross techniques, but that further advantages of complete network representation, simplified input data, and unlimited network size can be obtained. The major advantage of the method is its speed of convergence and lack of convergence problems. The program developed allows for solution by either the Hazen-Williams or the Darcy-Weisbach flow-head-loss relationships, and it can consider the effect of temperature variations on head loss throughout the network. GENFEM, a general, very efficient finite-element program, is easily adapted for the pipe-network problem. The mathematical basis and applications of this methodology are described in detail to allow easy adaptation of other finite-element programs for solving waterdistribution--network problems. (Bell-Cornell)

OPERATION CLEAN SWEEP,

Army Engineer District, Jacksonville, Fla. For primary bibliographic entry see Field 5G.

FIELD TESTS OF SLOW-RELEASE HERBI-

Army Engineer District, New Orleans, La. For primary bibliographic entry see Field 5G. W75-11193

AQUATIC PLANT CONTROL ON LAKE COR-PUS CHRISTI,

Army Engineer District, Galveston, Tex. For primary bibliographic entry see Field 5G. W75-11194

AQUATIC PLANT RESEARCH AND CONTROL IN FLORIDA,

Florida Dept. of Natural Resources, Tallahassee. J. C. Hudson

In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 25-27, August 1974.

Descriptors: *Aquatic weed control, *Research and development, *Florida, Financing, State governments, Participating funds, Water hyacinth. Identifiers: Elodea, Water milfoil.

The Florida Department of Natural Resources is responsible for coordinating research and control of noxious aquatic plants at an annual expenditure of \$2.8 million. Water hyacinth, Florida elodea, and Eurasian water milfoil are the most important, with elodea the major pest. Research efforts involve biological, chemical, and mechanical control methods, such as foreign exploration and in-troduction of insects and pathogens, botanical and ecological aspects of control, integrated chemical and biological techniques, utilization studies, ditchbank grass control, analysis of herbicides, and literature reviews. Results with mechanical harvesters to control water hyacinths in St. Johns River have not been encouraging. Use of white amur in conjunction with herbicides; establishment and effectiveness of the water hyacinth weevil; and use of foams, inverts, slow-release formulations, and new herbicides are being stu-died. Increased effectiveness and efficiency are needed, while decreasing drift and herbicide concentration. Airboats and an aircraft with a microfoil boom treated 35,000 acres during 1972-1973. Botanists help establish aquatic plant control programs, update control procedures, and monitor the Aquatic Plant Control Permit System. Training sessions for applicators were planned and new regulations on importation, cultivation, and transportation implemented. Matching state funds are available to local agencies for aquatic plant control. (See also W75-08289) (Buchanan-Davidson-Wisconsin) W75-11195

CRITERIA FOR HERBICIDE EVALUATION,

Environmental Protection Agency, Washington, D.C. Office of Pesticide Programs. For primary bibliographic entry see Field 5G. W75-11196

REGISTRATION OF HERBICIDES FOR

AQUATIC USE, Environmental Protection Agency, Washington. D.C. Office of Pesticide Programs. For primary bibliographic entry see Field 5G. W75-11197

DISSIPATION OF RESIDUES OF PHENOXY HERBICIDES APPLIED FOR WATER MILFOIL CONTROL IN LARGE RESERVOIRS,

Tennessee Valley Authority, Muscle Shoals, Ala. For primary bibliographic entry see Field 5B.

CHEMICAL CONTROL OF EGERIA DENSA,

Agricultural Research Service, Fort Lauderdale, For primary bibliographic entry see Field 5G. W75-11199

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

FIELD TESTING OF AQUATIC HERBICIDES FOR CONTROL OF EGERIA DENSA. University of Southwestern Louisiana, Lafayette.

Dept. of Plant Industry. For primary bibliographic entry see Field 5G.

W75-11200

AQUATIC PLANT CONTROL USING HERBI-CIDES IN A LARGE POTABLE WATER SUPPLY, Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Fisheries and Wildlife

Sciences.

For primary bibliographic entry see Field 5G. W75-11201

BIOLOGICAL CONTROL OF ALLIGATOR WEED, 1959-1972, Agricultural Research Service, Beltsville, Md.

For primary bibliographic entry see Field 5G. W75-11202

CONTROL OF EURASIAN BIOLOGICAL WATER MILFOIL,
Agricultural Research Service, Gainesville, Fla.

Biological Control Lab.

N. R. Spencer.

In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control. October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 75-83, August 1974. 1 tab, 8 ref.

Descriptors: *Biocontrol, *Aquatic weed control, Plant ecology, Plant growth, Life cycles, Distribution, Foreign research, Insects, Hosts. Identifiers: *Eurasian water milfoil, Lepidoptera,

Coleoptera, Homoptera, Parapoynx stratiotata, Litodactylus leucogaster.

Eurasian water milfoil, an introduced perennial submersed weed, has reached pest proportions by infesting thousands of acres in Chesapeake Bay, in Tennessee reservoirs, and in Florida and Georgia lakes and river basins by restricting water usage and decreasing property values. It grows under a wide range of conditions and forms a smothering blanket that crowds out other vegetation. Its ecology, growth habits, and life cycle are reviewed. Studies in the United States, Yugoslavia, and Pakistan have uncovered a number of biotic agents that show potential for controlling this plant. Twelve Lepidoptera, ten Coleoptera, one Diptera, and three Homoptera have been associated with Eurasian water milfoil. Many of the species are polyphytophagous and cannot be imported into the United States, but the associations demonstrate that the weed is a suitable host for insects belonging to several orders. At present control in the United States is limited to the use of herbicides and some cultural methods such as water management. One insect species, Parapoynx stratiotata, shows a potential for reducing vegeta-tive reproduction. Litodactylus leucogaster may reduce seed production. Further testing under United States quarantine will be needed to deter-mine which species could be imported for release in North America. (See also (Buchanan-Davidson--Wisconsin) W75-08289) W75-11203

INTEGRATED CONTROLS ON NOXIOUS AQUATIC PLANTS,

Texas Parks and Wildlife Dept., San Antonio. Statewide Noxious Vegetation Control Program. For primary bibliographic entry see Field 5G. W75-11204

UTILIZATION OF PHYTOPATHOGENS AS BIOCONTROLS FOR AQUATIC WEEDS, Florida Univ., Gainesville. Dept. of Plant Patholo-

For primary bibliographic entry see Field 5G. W75-11206

TRANSPLANTING SEA GRASS IN MISSISSIPPI SOUND,

Gulf Coast Research Lab., Ocean Springs, Miss. L. N. Eleuterius.

In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 103-106, August 1974.

Descriptors: *Marine plants, *Submerged plants, *Grasses, *Planting management, Spoil banks, Silting, Salinity, Mississippi, Bottom sediments, Estuaries, Slopes, Methodology, Turbidity. Identifiers: *Sea grass, *Transplantation,

Diplanthera wrightii.

The establishment of submerged plants by transplantation on spoil or other barren bottom areas in marine or estuarine systems is described. Effective anchors to moor the transplants covered with 20 feet or more of water were devised. Transplanting to barren bottom areas was possible within limits. The 'best' species, based on survival and extremely rapid growth, was Diplanthera wrightii. No appreciable differences in nutrient levels between vegetated and barren areas existed. Successful transplants were made in early spring and summer following mild winter temperatures or in summer following a severe winter, but low winter temperatures killed fall and winter transplants. Prolonged exposure to low salinity (5 parts per thousand or less) was detrimental. Sedimentation rates exceeding three inches per month also caused death. Spoil banks with steep slopes and spill areas where the substratum was being con-stantly reworked were unsuitable for transplantation due to erosive forces of waves and currents. Highly turbid water in near-shore areas also restricted plant growth. Sometimes eroded emergent spoil covered submerged spoil and killed the transplants. (See also W75-08289) (Buchanan-Davidson--Wisconsin) W75-11207

AQUATIC WEED FIELD TEST PROGRAM USING A CO2 ELECTRIC DISCHARGE CONVECTION LASER,

Army Engineer Waterways Experiment Station, Vicksburg, Miss. For primary bibliographic entry see Field 5A. W75-11208

EFFECTS CO2 LASER ON WATER HYACINTH.

Army Engineer Waterways Experiment Station, Vicksburg, Miss. or primary bibliographic entry see Field 5G. W75-11209

OPERATIONS PLATFORMS.

Army Engineer Waterways Experiment Station, Vicksburg, Miss. B. O. Benn

B. O. Benn. In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 119-127, August 1974. 7 fig.

Descriptors: *Transportation, *Application equipment, *Aquatic weed control, Application methods, Spraying, Barges, Boats, Irradiation. Identifiers: Laser transport, Archimedes' screw vehicles, Riverine utility craft, Screw propulsion

High-mobility operations platforms for herbicide sprayings and laser irradiation of aquatic weeds must be able to move freely in weed-infested waterways with reasonable speeds, have good control, be usable in unfavorable weather, be reliable, economical, and be readily transportable over normal roads between sites. A vehicle running on buoyant Archimedes' screws may be the most suitable. Compared to boats and wheeled and tracked vehicles, the two screw vehicles (the marsh screw and the Riverine Utility craft) run well in water, better in marsh areas, but poorly on firm soil. The marsh screw is more suitable for spray application than the Riverine Utility craft. Screw vehicles are one to ten times more effective than small boats or barges used as support vehicles for herbicide applications with comparatively little added cost. The laser system is too heavy for the present equipment, except barges, but the screw propulsion principle would be useful for the application of herbicide sprays and biological control organisms in inaccessible areas and as an ancillary vehicle for mechanical treatments. (See also W75-08289) (Buchanan-Davidson--Wisconsin)

HERBICIDE CHEMICALS AND THEIR EF-FECT ON THE AQUATIC ENVIRONMENT, Bureau of Sport Fisheries and Wildlife, Washing-

ton, D.C. Div. of Fishery Research. For primary bibliographic entry see Field 5C. W75-11211

REGISTRATION OF AQUATIC HERBICIDES, Office of the Chief of Engineers (Army), Washington D.C.

E. O. Gangstad, P. A. Frank, C. R. Walker, and J. R. Knoll.

In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p D3-D31, August 1974. 33 ref.

Descriptors: *Aquatic weed control. *Methodology, Herbicides, Biocontrol, Chemcontrol, Algal control, Grasses, Floating plants, Submerged plants, Canals, Irrigation ditches, Mechanical control, Harvesting, Vegetation Rates of application, Application methods. Identifiers: Emersed weeds, Broadleaved plants. Vegetation,

Registration of aquatic herbicides is imperative for their use in vegetation management. Forms of obnoxious aquatic vegetation can be algae or vascular aquatic plants such as floating, submersed, emersed, and marginal plants. Agriculture, recreation, property values, wildlife and fisheries management, potable water supplies, and navigation are affected by aquatic vegetation. Copper sulfate, dichlone, dichlobenil, acrolein, aromatic solvent, diquat, and endothall are used to manage algae; and 2,4-D, silvex, and diquat control floating weeds. To control submersed weeds, acrolein, aromatic solvent, copper sulfate, diquat, en-dothall, monuron or diuron can be used in irrigation canals and ditches; acrolein, aromatic solvent, and copper sulfate in drainage ditches; and dichlobenil, diquat, endothall, fenac, 2,4-D, silvex, and sometimes acrolein, aromatic solvent, simazine, and diuron can be applied in lakes, ponds, and reservoirs. Emersed and marginal weeds can be treated with 2,4-D or silvex and grass and grasslike species with dalapon, 2,4-D, or monosodium methanearsenate and trichloroacetic acid. Mechanical control devices, biocontrols (such as fish, snails, crayfish, insects, pathogens, and competitive vegetation), and ecological modifications can be used. The advantages and disadvantages of chemical methods are discussed. (See also W75-08289) (Buchanan-Davidson--Wisconsin) W75-11212

DISSIPATION OF RESIDUES OF PHENOXY HERBICIDES APPLIED TO THE WATERSHED, Oregon State Univ., Corvallis. School of Forestry. For primary bibliographic entry see Field 5B. W75-11213

WATER QUANTITY MANAGEMENT AND CONTROL-Field 4

Groundwater Management—Group 4B

DISSIPATION OF PHENOXY HERBICIDES AP-PLIED TO RIPARIAN VEGETATION,

Pennsylvania State Univ., University Park. School of Forestry.

For primary bibliographic entry see Field 5B. W75-11214

WATER HYACINTH RESEARCH IN PUERTO

RICO, Army Engineer Waterways Experiment Station, Vicksburg, Miss.

For primary bibliographic entry see Field 5G. W75-11215

WATER LEVEL MANIPULATION: A TOOL FOR AQUATIC WEED CONTROL, Louisiana Wild Life and Fisheries Commission,

Tioga. Aquatic Weed Research. L. V. Richardson.

In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p F25-F30, August 1974.

Descriptors: *Aquatic weed control, *Water level fluctuations, *Reservoirs, Rooted aquatic plants, Alligatorweed, Water hyacinth, *Louisiana, Sub-merged plants, Overflow, Skimming, Floating plants, Drawdown, Forages, Deer, Fisheries, Drying, Freezing.

Identifiers: Duckweed, Bayou DeSiard(La), Lac a nardia(La).

Louisiana has a severe submergent/emergent aquatic weed problem in 35 of its 40 reservoirs. Water level manipulation can improve water quality, improve fisheries, and control aquatic weeds. In Bayou DeSiard, a top laminar flow skimmed duckweed from the surface. During an overflow in Lac a nardia, boats pushed alligatorweed mats into fields where they dried when the water level was lowered. Some alligatorweed became terrestrial and was effectively browsed by deer. Drying and freezing during drawdown can control water hyacinths. However first and second year drawdowns can increase hyacinth infestations, since its seeds need to dry for germination. Fall-winter drawdowns give the best broad-range control of floating emergent and submergent plants but tim-ing should be determined by the target plant. The best time to stress plants is after the roots have utilized their stored energy and before the plant restores energy to its roots. A 40-70% reduction in surface acreage with 3/4 inch water being removed each 24 hours is recommended. Time and method of water return into the basin must be considered. Dissolved oxygen must be monitored to avoid fish kill. Encroachment of undesirable plants must be checked and the public informed of plans. (See also W75-08289) (Buchanan-Davidson--Wisconsin) W75-11216

THE AQUATIC WEED PROBLEM. 1. IDENTIFI-

Victoria State Coll., Carlton (Australia). Dept. of Plant Physiology. For primary bibliographic entry see Field 2I.

W75-11220

d

d

ls

s, al

nd

ALGAE IN BALTIMORE'S RESERVOIRS, Baltimore City Dept. of Public Works, Md. Water Supply Treatment and Pumping Div. For primary bibliographic entry see Field 5C.

A PRACTICAL WAY TO FIND MINIMUM DRAINAGE AREA FOR A WELL, Gruy (H. J.) and Associates, Inc., Dallas, Tex. For primary bibliographic entry see Field 4B. W75-11290

GENERATION OF ARID ZONE RAINFALL AND RUNOFF.

University of New England, Armidale (Australia). School of Natural Resources.

For primary bibliographic entry see Field 2A.

SOME OBSERVATIONS ON RAINFALL IN WESTERN NEW SOUTH WALES, New South Wales Univ., Kensington (Australia).

School of Wool and Pastoral Sciences. nary bibliographic entry see Field 2B. For primary W75-11304

DROUGHTS, DISTRIBUTIONS AND DEPEN-DENCE: AN ANALYSIS OF SOME SYNTHETIC DATA GENERATION METHODS,

School of Civil Engineering. For primary bibliographic entry see Field 2E. W75-11305 New South Wales Univ., Kensington (Australia).

VARIABILITY, PERSISTENCE AND YIELD OF AUSTRALIAN STREAMS, Monash Univ., Clayton (Australia). Dept. of Civil

Engineering.
For primary bibliographic entry see Field 2E.
W75-11308

GUIDELINES FOR THE IDENTIFICATION OF POTENTIAL ENVIRONMENTAL IMPACTS IN THE CONSTRUCTION AND OPERATION OF A

RESERVOIR, Illinois Univ., Urbana. Dept. of Forestry For primary bibliographic entry see Field 5C. W75-11316

4B. Groundwater Management

HYDROGEOLOGY AND WATER RESOURCES OF MIDDLE KIRKLAND CREEK BASIN, YAVAPAI COUNTY, ARIZONA, Arizona Univ., Tucson. Dept. of Hydrology and

Water Resources. J. H. Randall.

Arizona University, Tucson, Department of Hydrology and Water Resources. MS Thesis, 1974. 57 p, 10 fig, 6 tab, append, 22 ref.

Descriptors: *Hydrogeology, *Aquifers, *Aquifer characteristics, *Sediments, *Basalts, *Alluvial aquifiers, *Arizona, Groundwater, Structural geology, Alluvium, Soil types, Conglomerate rocks, Water yield, Zone of saturation, Flood plains, Soil mechanics.

Identifiers: *Kirkland Creek(Ariz), *Yavapai County(Ariz).

Middle Kirkland Creek basin lies at the northern edge of the basin and range province 20 miles southwest of Prescott, Arizona. The hydrogeologic system of the basin includes two major aquifers. alluvial sediments and basaltic volcanics. The alluvial sediments are a series of granitic pebble conglomerates intercalated with basalt flows in some areas overlaid by fine-grained lacustrine sediments that grade laterally into a pebble conglomerate. Overlying this unit is a thin narrow deposit of unconsolidated sands, gravels, and silts representing the flood-plain alluvium. The basalt aqu sists of a series of more than 1000 feet of fractured basalt flows interbedded with cinder and conglomeratic layers. The water production potential of the basaltic units in the central portion of the basin is unknown. However, the survey indicates that the hydrogeologic system allows a thick zone of saturation storing large quantities of water. Wells drilled in the Kirkland gorge could have an estimated yield of 200 to 1000 gpm. (McLacklan-

COMPUTER ALGORITHMS USEFUL FOR DETERMINING A SUBSURFACE ELECTRICAL PROFILE VIA HIGH FREQUENCY PROBING. California Univ., Livermore. Lawrence Livermore Lab. For primary bibliographic entry see Field 8G.

DETERMINATION OF REGIONAL HYDRAU-LIC CONDUCTIVITY THROUGH USE OF C-14 DATING OF GROUNDWATER, Geological Survey, Reston, Va. For primary bibliographic entry see Field 2F.

QUALITY OF WATER IN AQUIFERS OF THE AMARGOSA DESERT AND VICINITY,

NEVADA, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 5B. W75-10932

REVIEW OF CONFERENCE ON HYDROLOGY OF DEEP SEDIMENTARY BASINS,

Tulsa Univ., Okla. Dept. of Earth Sciences. For primary bibliographic entry see Field 5B. W75-10935

THE MINOR AND TRACE ELEMENTS, GAS, AND ISOTOPE COMPOSITIONS OF THE PRIN-CIPAL HOT SPRINGS OF NEVADA AND OREGON

Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 2K. W75-10937

ESTIMATED AVAILABILITY OF SURFACE AND GROUND WATER IN THE POJOAQUE RIVER DRAINAGE BASIN, SANTA FE COUN-TY, NEW MEXICO,

Geological Survey, Albuquerque, N. Mex. For primary bibliographic entry see Field 4A. W75-10938

GROUND WATER IN THE CORVALLIS-AL-BANY AREA, CENTRAL WILLAMETTE VAL-LEY, OREGON,

Geological Survey, Reston, Va. For primary bibliographic entry see Field 2F. W75-10940

RECHARGE AREAS OF THE FLORIDAN AQUIFER IN SEMINOLE COUNTY AND VICINITY, FLORIDA, Geological Survey, Tallahassee, Fla.

For primary bibliographic entry see Field 7C. W75-10944

HORIZONTAL GROUNDWATER COLLEC-TORS, HYDRAULICS AND DESIGN, International Water Supply Ltd., Montreal

(Quebec) For primary bibliographic entry see Field 8B. W75-10998

HORIZONTAL GROUNDWATER COLLEC-TORS, 'CANADA'S LARGEST WATER WELL', Prince George City Engineer's Office (British Columbia).

For primary bibliographic entry see Field 8B.

ILLINOIS LANDFILL LAW MAY EFFECT NEARBY STATES. For primary bibliographic entry see Field 5B.

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B-Groundwater Management

HOW SILICA AFFECTS IRON REMOVAL FROM GROUNDWATER,

Yule, Jordan and Associates, Camp Hill, Pa. Environmental Engineering Div. For primary bibliographic entry see Field 5F

W75-11016

STUDY OF CRITERIA AND MODELS STABLISHING OPTIMUM LEVEL OF HYDROGEOLOGIC INFORMATION FOR GROUNDWATER BASIN MANAGEMENT, Minnesota Univ., Minneapolis. Dept. of Geology

and Geophysics.
For primary bibliographic entry see Field 2F.

MANAGEMENT OF RETARDATION OF SALT WATER INTRUSION IN COASTAL AQUIFERS, North Carolina State Univ., Raleigh, Dept. of Civil Engineering.

For primary bibliographic entry see Field 2F.

W75-11058

ENDEMIC NEPHROPHATHY AND ITS RELA-TION TO THE CONTAMINATION OF WELL WATER BY PHENOLIC COMPOUNDS IN BARSA-ARAD (NEFROPATIA ENDEMICA SI RELATIA CU IMPURIFICAREA PRIN COM-POUSI FENOLICI IN APELE FINTINILOR DIN COMUNA BARSA-ARAD), For primary bibliographic entry see Field 5B

W75-11105

DEPRIVATION CONTRIBUTION AND INTER-FERENCE EFFECTS OF MULTIPLE WELLS IN A COMMON AQUIFER,

Oklahoma Univ., Norman. Dept. of Civil Engineering and Environmental Science.

J. F. Harp, and J. G. Laguros. Ground Water, Vol 13, No 3, p 251-253, May-June 1975. 1 fig. 1 tab.

Descriptors: *Groundwater, *Aquifers, *Management, *Groundwater mining, *Pumping, Overdraft, Water wells, Groundwater resources, Water supply, Drawdown, Water table, Distance, Equilibrium.

Identifiers: *Depleted aquifer, *Interference effects, *Depletion effects, Multiple wells, Depriva-

A method of assessing groundwater interference effects of multiple wells upon any given well in an aquifer was presented. The method specifically re-lated to depleted aquifers and attempted to assign the responsibility for the depletion effects to all users on a reliable basis. This basis entails the fun-damental relationships between the pertinent variables and is not a simple percentage of water usage rates. The method took into account both flow magnitude and radial distances from all users to the given depleted account both flow magnitude and radial distances from all users to the given depleted well. Large flows at longer distances, in general, affected a given well less than smaller flows at closer distances. The methodology ap-plied was developed as a result of a legal suit where relative responsibility among several users for depletion effects had to be assigned. The method assigned the effects, or deprivation contribution, of all water users on any given well in an aquifer common to all the wells. The limitations of the method were also discussed. (Sanderson-ISWS) W75-11142

URANIUM MINERALIZATION BY GROUND WATER IN SEDIMENTARY ROCKS, JAPAN. Power Reactor and Nuclear Fuel Development

Corp., Tokyo (Japan). Raw Materials Div For primary bibliographic entry see Field 2F. A STUDY OF FACTORS CONTROLLING THE CHEMICAL QUALITY OF WATER IN CART-WRIGHT CREEK BASIN, WILLIAMSON COUNTY, TENNESSEE,

Vanderbilt Univ., Nashville, Tenn. Dept. of Geology.

For primary bibliographic entry see Field 2K. W75-11164

SOLID WASTES, ANIMAL REFUSE, AND ORGANIC RESIDUES DISPOSAL, AND THE QUALITY OF GROUND WATER,

Tuskegee Inst., Ala. School of Applied Sciences. For primary bibliographic entry see Field 5B. W75-11244

APPROXIMATION FOR STEADY INTERFACE BENEATH A WELL PUMPING FRESH WATER OVERLYING SALT WATER,

New Mexico Inst. of Mining and Technology. R. G. Haubold

Ground Water, Vol 13, No 3, p 254-259, May-June, 1975. 3 fig, 1 tab, 12 ref.

Descriptors: *Saline water intrusion, *Saline water-fresh water interfaces, *Mathematical models, *Estimating equation, Percolation, Seepage, Interfaces.

Identifiers: *Hele-Shaw model, *Muskat flow through porous media.

The computation of the shape of the interface between fresh water pumped from a well and the salt water beneath it was based on an empirically derived modification of Muskat's approximation for the height of the cone beneath a well. Differing depths of well penetrations and their effect on the upconed interface were investigated with the approximation. The computed interfaces (actually transition zones) were compared with corresponding interfaces determined experimentally Hele-Shaw model. Alteration of the length of the production zone of a well at a constant pumping rate did not influence the shape or position of the interface significantly. Though the approximation fits closely with the model, it should be refined further. (Bradbeer-NWWA)

COLORADO CITY SOLVES ITS SAND PUMP-ING PROBLEMS

Wright Water Engineers, Inc., Denver, Colo For primary bibliographic entry see Field 8C. W75-11261

GROUND WATER DEPLETION AND SUB-SIDENCE PROBLEMS IN TAIPEI BASIN, National Taiwan Univ., Taipei. Hydraulic Lab.

In: International Symposium on Development of Ground Water, November 26-29, 1973, Madras, India, Vol 1, p IIB 17-28 (1973). 9 fig, 1 tab, 3 ref.

Descriptors: *Land subsidence, *Groundwater, *Artesian aquifers, *Clays, Fluid withdrawal, Potentiometric level, Compressibility, Head loss, Instrumentation.

Identifiers: Clay stringers, Pieziometric decline, *Taiwan(Taipei basin).

Releveling of bench marks in 1971 and 1973 indicates that land subsidence of the ground surface in the Taipei Basin has exceeded 1.8 meters since 1957. In the sharp subsidence area, subsidence which was about 0.6 meters in 1966 has doubled. The maximum rate of subsidence in recent years has been about 25 cm per year. As a result of accelerated urbanization of the Basin area, most of the modern ground water development has oc-curred since 1957. The annual pumpage was 8.9 million cubic meters, 328 million cubic meters, and 435 million cubic meters for 1957, 1964, and 1969, respectively. As a result of an imposition of strict controls, the extracted water was reduced to 249 million cubic meters in 1972. Plots of subsidence versus decline in artesian pressure suggest that pressure decline is a major cause of the subsidence. Consolidation data are used to verify this relationship. However, other causes such as compaction of soil, tectonic adjustment, and loading at the land surface may have contributed to the sub-sidence. (Bradbeer-NWWA) W75-11262

CONOCO TECHNOLOGY CURBS PRODUC-TION POLLUTION, Continental Oil Co., Houston, Tex. For primary bibliographic entry see Field 5G.

FORMULATION OF BOUNDARY CONDITIONS AT THE SURFACE OF A POROUS MEDIUM, Alberta Univ., Edmonton.

For primary bibliographic entry see Field 8B.

W75-11269

UNCONVENTIONAL AIR DRILLING REDUCES WELL COSTS.
For primary bibliographic entry see Field 8C.

THE KINETICS OF CRYSTALLIZATION OF SCALE-FORMING MINERALS, State Univ. of New York, Buffalo

For primary bibliographic entry see Field 8G. W75-11273

W75-11270

ANALYSIS OF FACTORS INFLUENCING MO-BILITY AND ADSORPTION IN THE FLOW OF POLYMER SOLUTION THROUGH POROUS MEDIA, Shell Oil Co., Houston, Tex.

For primary bibliographic entry see Field 8B. W75-11275

HOW STEAM IS PRODUCED AND HANDLED AT THE GEYERS,

R. E. Snyder World Oil, Vol 180, No 7, p 43-48, June, 1975. 7 fig. 1 tab, 6 ref.

Descriptors: "Geothermal studies, "Steam, *Energy, "Thermal powerplants, Facilities, Industrial plants, Geology, Groundwater, Production, *California.

Identifiers: *Geoth steam, The Geysers *Geothermal energy, Superheated

Development by well clusters around a plant site is necessary when using superheated steam to produce energy. The planning of such developments, based on geology, completed wells and cur-rent economics is discussed. The actual plant operation, as well as the payment procedures, is outlined. (Bradbeer-NWWA) W75-11280

TESTS SHOW POTASSIUM MUD VERSATILI-

NL Industries, Inc., Houston, Tex. Baroid Div. For primary bibliographic entry see Field 8G. W75-11284

HOW TO FIND TRANSITION ZONES IN SOFT FORMATIONS, Continental Oil Co., Houston, Tex.

For primary bibliographic entry see Field 8G. W75-11285

HOW TO MAKE SQUEEZE CEMENTING SUC-CESSFUL,

H

Rike Service, New Orleans, La. For primary bibliographic entry see Field 8F.

WATER QUANTITY MANAGEMENT AND CONTROL-Field 4

Watershed Protection—Group 4D

W75-11286

MAKING LOG ANALYSTS OF GEOLOGISTS. For primary bibliographic entry see Field 7C

SUBSURFACE WATER - TOOL FOR PETROLEUM EXPLORATION,

Mobil Research and Development Corp., Dallas,

Society of Petroleum Engineers Journal, Vol 15, No 1, p 50-64, February, 1975. 7 fig, 2 tab, 92 ref.

Descriptors: *Groundwater, *Water utilization, *Exploration, *Oil industry, *Mining, Water chemistry, Trace elements, Permeability, Faults(Geologic), Dissolved solids, Groundwater movement, Water circulation, Locating, Alternative water use.

Identifiers: Oil exploration

The close association of hydrocarbon accumulations with subsurface waters has led to the use of properties of these waters as a secondary exploration tool. Both chemical and physical characteristics of subsurface waters have been utilized in the search for petroleum. The movement of subsurface waters has made a significant contribution to the accumulation of petroleum. In addition to dissolved organic and inorganic constituents, hydrodynamic movement, oxidation-reduction potentials, and water classification systems have een advocated for use in petroleum exploration Water properties have been utilized in locating permeability barriers, faults, geopressured zones, and unconformities. Examples of water as an exploration tool are given. (Bradbeer-NWWA)

A PRACTICAL WAY TO FIND MINIMUM DRAINAGE AREA FOR A WELL,

Gruy (H. J.) and Associates, Inc., Dallas, Tex. R. K. Prasad.

Oil and Gas Journal, Vol 71, No 31, p 118-120, July 30, 1973. 2 fig. 2 tab, 5 ref.

Descriptors: *Reservoir yield, *Water supply, *Reservoir-storage, *Groundwater, Supply, Mathematics, Equations, Forecasting, Oil, Reservoir(Oil), Oil wells, Aquifers.

Identifiers: Production capacity, Aquifer develop-

A new method of calculating the drainage area and the hydrocarbon pore volume assigned to a new well is introduced. It assumes that calculation of the drainage area is dependent on the sensitivity of the pressure gauge, error in chart reading, the background noise in the reservoir, the superposition of drawdown and shutin transients, and the flow rates. An example solution using the new equations is presented. Other applications for the method are given. (Bradbeer-NWWA) W75-11290

CEMENTING TODAY'S PROBLEM WELLS. For primary bibliographic entry see Field 8F. W75-11293

HOW DOWNHOLE TEMPERATURES, PRESURES AFFECT DRILLING: PART 4: PITFALLS IN OVERPRESSURE PREDICTION, Continental Oil Co., Ponca City, Okla. Production

Research Dept. For primary hibliographic entry see Field 8G. W75-11294

D

7

m.

15-

ted

e is to

op-

lant

, is

ILI-

OFT

SUC-

HOW DOWNHOLE TEMPERATURES, PRESURES AFFECT DRILLING; PART 5: PRE-

DICTING HYDROCARBON ENVIRONMENTS WITH WIRELINE DATA,

Continental Oil Co., Houston, Tex. Production Engineering Services. For primary bibliographic entry see Field 8G. W75-11295

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING; PART 6: COR-RELATING GEOPRESSURE GRADIEN WITH HYDROCARBON ACCUMULATIONS, GRADIENTS Continental Oil Co., Houston, Tex. Production

Engineering Services.
For primary bibliographic entry see Field 8G.

W75-11296

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING; PART 7: THE SHALE RESISTIVITY RATIO - A VALUABLE TOOL FOR MAKING ECONOMIC DRILLING DECISIONS.

Continental Oil Co., Houston, Tex. Production Engineering Services.

For primary bibliographic entry see Field 8G. W75-11297

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING: PART 8: NEEDLESS SPENDING OF DRILLING AND EX-PLORATION MONEY CAN BE PREDICTED-

AND PREVENTED, Continental Oil Co., Houston, Tex. Production **Engineering Services**

For primary bibliographic entry see Field 8G. W75-11298

WATER SYSTEM ACCESSORIES, For primary bibliographic entry see Field 8C.

4C. Effects On Water Of Man's Non-Water Activities

MAN'S INFLUENCE ON THE HYDROLOGICAL CYCLE: A DRAFT REPORT OF THE UNESCO/FAO WORKING GROUP ON THE IN-TERNATIONAL HYDROLOGICAL DECADE Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div For primary bibliographic entry see Field 2A.

W75-10863

BALANCING THE EFFECTS OF MAN'S AC-TIONS ON THE HYDROLOGICAL CYCLE, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant For primary bibliographic entry see Field 2A.

W75-10865

IMPACT OF ENERGY DEVELOPMENT ON THE LAW OF THE COLORADO RIVER,

California Univ., Los Angeles, School of Law. G. D. Weatherford, and G. C. Jacoby. Natural Resources Journal, Vol 15, P 171-213, January, 1975. 5 fig, 2 tab, 86 ref.

Descriptors: *Water supply, *Water alloca-tion(Policy), *Water law, *Colorado river, *Electric power production, Water manage-ment(Applied), Water conservation, Water mentappined), water conservation, water resources, Water regulrements, Water utilization, Natural resources, Water rights, Prior appropria-tion, Public rights, Water demand, Competing uses, Colorado river basin, Arid lands, Consump-tive use, Reasonable use, Fossil fuels. Identifiers: *Energy development. Generally, the Colorado river flow is divided among users on the basis of beneficial consumptive use. New societal demands for water along with large economic forces to exploit fossil fuels in the Colorado river basin are causing profound changes in the basin. Claims for greater shares of the flow are being made by Indians, recreationists, environmentalists, supporters of fish and wildlife, and commercial mining interests. The flexibility of the law of the river pertaining to energy development, water demand, and competing forces discussed. (Robinett-Arizona) W75-10869

EFFECTS OF PINYON-JUNIPER REMOVAL ON NATURAL RESOURCE PRODUCTS AND USES IN ARIZONA,

Forest Service (USDA), Phoenix, Ariz. Rocky Mountain Forest and Range Experiment Station. For primary bibliographic entry see Field 3B.

STABILIZATION AND RECONSTRUCTION OF TEXAS COASTAL FOREDUNES WITH VEGETATION,

Texas Tech Univ., Lubbock.

For primary bibliographic entry see Field 2L. W75-10887

REVEGETATING DISTURBED AREAS IN THE SEMIARID SOUTHWEST, Forest Service (USDA), Albuquerque, N. Mex.

Rocky Mountain Forest and Range Experiment Station.

For primary bibliographic entry see Field 4D. W75-10892

APPROXIMATE ANNUAL WATER BUDGETS OF TWO CHAINED PINYON-JUNIPER SITES, Utah State Univ., Logan. Watershed Science Unit. For primary bibliographic entry see Field 4A. W75-10896

BIOCHROME ANALYSIS AS A METHOD FOR ASSESSING PHYTOPLANKTON DYNAMICS, PHASE II.

Arkansas Univ., Fayetteville. Dept. of Botany and Bacteriology.
For primary bibliographic entry see Field 5C.
W75-11052

WATER POLLUTION FROM NONPOINT SOURCES, For primary bibliographic entry see Field 5B. W75-11158 Midwest Research Inst., Kansas City, Mo

GROUND WATER DEPLETION AND SUB-SIDENCE PROBLEMS IN TAIPEI BASIN, National Taiwan Univ., Taipei. Hydraulic Lab. For primary bibliographic entry see Field 4B. W75-11262

4D. Watershed Protection

SHRUB TRANSPLANTING FOR WATERSHED MANAGEMENT AND RANGE IMPROVEMENT

IN IRAN, Arizona Univ., Tucson. Dept. of Watershed Management.

N. Nemati. Arizona University, Tucson, Department of Watershed Management, MS Thesis, 1974, 52 p, 21 fig, 4 tab, 18 ref.

Descriptors: *Watershed management, *Erosion control, *Arid climates, *Shrubs, Erosion, Vegetation, Precipitation, Moisture deficit, Revegetation, Humidity, Evaporation, Range

The central plateau of Iran is virtually void of plant growth due to cold winters, hot summers, low precipitation, low atmospheric humidity, and high evaporation. Transplanting shrub species has been shown to be one possible way to revegetate these rangelands. Fourwing saltbush (Atriplex canescens) was the most adaptable of the three saltbushes tested for growth in nurseries in plastic bags and transplanted in the central plateau of Iran. Their adaptability to the harsh climate will help restore the watershed, provide effective erosion control, and generally improve the vegetation. (McLachlan-Arizona) W75-10870

SEASONAL VARIATIONS IN THE INFILTRA-TION RATE OF A WHITEHOUSE SOIL IN SOUTHERN ARIZONA,

Arizona Univ., Tucson. Dept. of Watershed Management

For primary bibliographic entry see Field 2G. W75-10873

FACTORS AFFECTING EROSION IN A SEMI-ARID WATERSHED, Arizona Univ., Tucson. Dept. of Civil Engineering

and Engineering Mechanics. For primary bibliographic entry see Field 2J. W75-10884

REVEGETATING DISTURBED AREAS IN THE

SEMIARID SOUTHWEST, Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station E. F. Aldon.

Journal of Soil and Water Conservation, Vol 28, No 5, p 223-225, September-October, 1973. 6 fig,

Descriptors: *Soil stabilization, *Semiarid climates, *Southwest U.S., *Vegetation establishment, Rehabilitation, Density, Watershed manage-Identifiers: Fourwing saltbush, Alkali sacaton

The harsh climatic extremes of the semiarid Southwest make it difficult and often impossible to establish plants for soil stabilization. A 20 year watershed rehabilitation project concentrated on the establishment of two plants native to the area the establishment of two plants native to the area-fourwing saltbush (Atriplex canescens (Pursh) Nutt.) and alkali sacaton (Sporobolus airoides (Torr.) Torr.). A step-by-step planting guide is presented for each plant including growing trans-plants and field planting procedures. Information is also provided to determine those areas that are suitable for plant establishment and the amount of cover and stabilization that may be expected. (Mastic-Arizona)

WATER RESOURCES OF THE LOWER ST. CROIX RIVER WATERSHED, EAST-CENTRAL

Geological Survey, Reston, Va. For primary bibliographic entry see Field 7C. W75-10945

WATER RESOURCES OF THE SNAKE RIVER WATERSHED, EAST-CENTRAL MINNESOTA, Geological Survey, Reston, Va. For primary bibliographic entry see Field 7C. W75-10946

WATER RESOURCES OF THE LOWER MIN-WALER RESOURCES OF THE LOWER MIN-NESOTA RIVER WATERSHED, SOUTH-CEN-TRAL MINNESOTA, Geological Survey, Reston, Va. For primary bibliographic entry see Field 7C.

W75-10947

WATER RESOURCES OF THE CANNON RIVER WATERSHED, SOUTHEASTERN MIN-

Geological Survey, Reston, Va. For primary bibliographic entry see Field 7C. W75-10948

AN ASSESSMENT OF SNOWPACK DEPLE-TION-SURFACE RUNOFF RELATIONSHIPS ON FORESTED WATERSHEDS, Arizona Univ., Tucson. School of Renewable

Natural Resources. For primary bibliographic entry see Field 4A. W75-11049

GUIDELINES FOR REVEGETATION AND STA BILIZATION OF SURFACE MINED AREAS IN THE WESTERN STATES,

Colorado State Univ., Fort Collins. Dept. of Range Science.

W. Cook, R. M. Hyde, and P. L. Sims Colorado State University, Fort Collins Range Science Department, Range Science Series No 16, December, 1974. 70 p, 5 fig, 9 tab, 1 append

Descriptors: *Revegetation, *Mining, reclamation, *Arid lands, *Rehabilitation, *Limiting factors, Coals, Evapotransporation, Mine wastes, Reclamation, Oil shales, Fossil fuels, Uranium radioisotopes, Soils, Drought tolerance, Precipitation intensity, Erosion, Environmental effects, Southwest US.

Rehabilitation procedures should be site specific They must be implemented by those familiar with the ecological sturucture and successional responses characteristic of the site to be reclaimed. Factors to be considered in reclamation efforts are physical and chemical properties of the soils, degree of slope and exposure, dominant plant spe-cies present before the disturbance, and the area's climatic variability. Moisture is the limiting factor in successful rehabilitation of lands disturbed by mining and exploration for coal, oil shale, and uranium in the western states. Most areas of the West are difficult to reclaim because precipitation is not only low but the occurrences are also erratic and unpredictable. In most desert areas natural plant regeneration takes place only every five to seven years when two or more successive favora-ble moisture years occur. Therefore, they are subject to great stress from intermittent precipitation, extremely low and high temperatures, strong winds, and excessive evaporation. This study of fers guidelines to aid reclamation efforst in the difficult western region. (Bowden-Arizona)

DERIVATION OF SURFACE WATER LAG TIME FOR CONVERGING OVERLAND FLOW, New Mexico Inst. of Mining and Technology,

For primary bibliographic entry see Field 2E. W75-11156

GAUGING SMALL DIFFICULTIES IN CATCHMENTS - A CASE STUDY, New South Wales Univ., Kensington (Australia). School of Civil Engineering. For primary bibliographic entry see Field 2E. W75-11306

HYDROLOGIC RELATIONS CONVERTED AND UNDISTURBED SAGEBRUSH LANDS: THE STATUS OF OUR

KNOWLEDGE, Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.

D. L. Sturges. Research Paper RM-140, March 1975, 23 p, 18 fig, 41 ref. 4 tab

Descriptors: *Range management, *Watershed management, *Water yield improvement, Climanagement, *Water yield improvement, mates, Soils, Vegetation, *Snow management, Rrushlands, Grasses, Shrubs, Sagebrush, Brushlands, Grasses, Shrubs, Sagebrush, Hydrology, Brush control, Snowmelt, Runoff, Management, Land management. Identifiers: Artemisia tridentata.

Watershed management for big sagebrush range lands is discussed. Climate, soils, vegetation, snow accumulation, and water yields are described, followed by a review and discussion of how management practices alter vegetative com-position and the hydrologic regime. Potential hydrologic benefits from managing blowing snow in the big sagebrush type are outlined, and research needs are highlighted. (Witt-IPC) W75-11313

WATERSHED MANAGEMENT IN THE BLACK HILLS: THE STATUS OF OUR KNOWLEDGE, Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. H. K. Orr

Research Paper RM-141, 12 p, March 1975. 10 fig, 26 ref.

Descriptors: *Watershed management, Climates, Geology, Soils, Vegetation, Water yield, Research priorities, Data collections, Model studies, Surface waters, Groundwater recharge, *South Dakota, Watersheds(Basins), Great plains, Water yield improvement. Identifiers: *Black Hills(SD).

Climate, geology, soils, vegetation, and water yields are briefly described, followed by a review and discussion of watershed management research and problems unique to the Black Hills. Research needs with respect to water quality, data collection, and model development are highlighted. (Witt-IPC) W75-11318

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

EPIFAUNAL INVERTEBRATES AS INDICA-TORS OF WATER QUALITY IN SOUTHERN LAKE PONTCHARTAIN,

D *| Se te W Id

A soi UI US Pb sup and

hav of i

rece

The

repr

appr

pote

grou

befo

ESTI

New Orleans Univ., La. Dept. of Biological Sciences. For primary bibliographic entry see Field 5C. W75-10852

PHYTOPHTHORA SPECIES IN ARIZONA: ITS OCCURRENCE IN RECYCLED IRRIGATION

WATER. California Univ., Berkeley. Dept. of Plant Patholo-

gy. S. V. Thomson, and R. M. Allen. Progressive Agriculture in Arizona, Vol 27, No 3, p 8-9, May-June, 1975. 2 fig, 11 ref.

Descriptors: "Recycling, "Citrus fruits, "Irrigation water, "Spores, "Fungi, "Pollutant identification, "Arizona, Return flow, Water reuse, Hazards, Tailwater, Epiphytology. Identifiers: "Phytophthora.

A study was made of the effect of irrigation return flow to citrus orchards in the vicinity of Phoenix, Arizona, when this recycled water carried spores of the parasitic fungi Phytophthora. The pres of zoospores in water recycled to the cropped land from which it was collected posed a serious threat for several reasons, including the danger of infection to clean orchards; the pathogenicity of all spe-cies of Phytophthora, particularly since they are well adapted to an aquatic environment; and the contact possible with tree trunks during flood irrigation. Water from 20 sites in citrus groves was sampled over a period of a year from the tailends of 4 irrigation ditches, 9 sumps, recycled water at the head-ends of 4 irrigation ditches, and project water at 2 canal locations. The method of processing the samples is given. Phytophthora spp. were isolated in 93 of 599 samples, and with one exception, all were identified as present in waste water from citrus orchards. Well-water, initially relatively free from fungi, was heavily contaminated after passage through a citrus orchard or other cropped acreage. Infection is more likely in citrus tree trunks from flood irrigation by recycled water contaminated with Phytophthora spp. when injuries to the trunk from cultivation procedures were already present. (Paylore-

A SIMPLE AND INEXPENSIVE TECHNIQUE FOR DETERMINING COLORED LIGHT IN-

TENSITY UNDERWATER, Genesee Community Coll., Batavia, N.Y. Mathematics and Science Div.

For primary bibliographic entry see Field 7B. W75-10919

THE GEOCHEMICAL CYCLE OF ARSENIC IN LAKE WASHINGTON AND ITS RELATION TO

OTHER ELEMENTS, Washington Univ., Seattle. Dept. of Oceanog-

For primary bibliographic entry see Field 5B.

GEOCHEMICAL RECONAISSANCE OF SURFI-CIAL MATERIALS IN THE VICINITY SHAWANGUNK MOUNTAIN, NEW YORK.

NY State Mus Sci Serv Map Chart Ser, 21 p 1-20,

Descriptors: *Geochemistry, *New York, Copper, *Lead, Zinc, *Surveys, Streams, Sediments, Soils, Toxicity, *Heavy metals, Analytical techniques, Mountains, *Pollutant identification, Water pollution effects. Identifiers: *Shawangunk Mts(NY).

A reconnaissance survy of stream sediments and soils in the vicinity of Shawangunk Mountian, Ulster, Orange, and Sullivan Counties, New York, USA was made for combined heavy metals (Cu, Pb, Zn) using dithizone field methods and other supporting laboratory techniques. A number of anomalous areas are defined by the drainage system. High concentrations were observed in the vicinity of the old Pb Zn mines and prospects that have been long known in the valley and a number of new anomalies or extensions of the previously recognized areas of mineralization were observed These are discussed and located on the accompanying maps. Soil surveys on the valley floor showed some anomalous profiles, but difficulty in reproducing the data led to abandonment of this approach. Waters in a few small streams in the vicinities of Wurtsboro and Otisville contain potentially toxic concentrations of Pb, surface and ground waters in these areas should be analyzed right 1974, Biological Abstracts, Inc. W75-10928

o

3,

urn

ores

nce

reat fecUSE OF PRODUCTIVITY OF PERIPHYTON TO ESTIMATE WATER QUALITY, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 5B. W75-10936

THE MINOR AND TRACE ELEMENTS, GAS, AND ISOTOPE COMPOSITIONS OF THE PRIN-

CIPAL HOT SPRINGS OF NEVADA AND OREGON,

Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 2K. W75-10937

POPULATION DYNAMICS OF PROTOZOA IN

WASTEWATER, Howard Univ., Washington, D.C. Bioenvironmental Engineering and Sciences Research Lab For primary bibliographic entry see Field 5D. W75-10957

ACTIVATED CARRON IN THE WATER TREATMENT PLANT,

Massachusetts Dept. of Public Health, Lawrence. Lawrence Experiment Station.
For primary bibliographic entry see Field 5D. W75-10992

MINITEST METHOD FOR MONITORING EF-FLUENT QUALITY, Uppsala Univ. (Sweden). Algal Assay Lab.

For primary bibliographic entry see Field 5D.

ADVANCES IN THE DETECTION OF WATER POLLUTANTS,

Canada Centre for Inland Waters, Burlington (Ontario).

Chemistry in Canada, Vol 27, No 6, p 26-29, June 1975, 45 ref.

Descriptors: *Analytical techniques, *Reviews, *Pollutant identification, Organic matter, Municipal wastes, Industrial wastes, Spectrophotometry, Gas chromatography, Mass spectroscopy, Remote sensing, Phenols. Identifiers: Coprostanol, Cholesterol, Voltam-

A review of analytical methodology of water for the Canada Centre for Inland Waters (CCIW) from December 1973 to November 1974 is given. All research of the CCIW is done as a response to needs of a federal regional laboratory, a research component of the CCIW, or an international organization in which Canada is actively collaborating. Progress in chromatography/mass spectrometry included the methodology for analyzing organochlorinated pesticides, dithiocarbamates, and 1,4-oxathiins as well as a number of industrial pollutants. Methods were gas chromatography, high pressure liquid chromatography, thin-layer chromatography, GC/MS, NMR, and infrared. The analysis of organic pollutants (phenols, formaldehyde), inorganic pollutants (chlorides, ar-senic, antimony, selenium), and detergents (phosphate, citric acid) has also been developed. Methods were spectrophotometry, of the types UV, visible, molecular fluorescence, IR, and atomic absorption. Publications have been made under electro-analytical methodology, involving activities in the area of applying selective ion electrodes to multi-element analysis. Other related developments were in voltammetric applications. Biological analysis utilized coprostanol and cholesterol as indicators of excretal pollution in sewage and industrial treatment. Radiochemistry, electron microscopy, and remote sensing studies were also discussed. (Prague-FIRL) W75-10995

STABILITY OF NITROSAMINES IN SAMPLES OF LAKE WATER, SOIL, AND SEWAGE, Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.

For primary bibliographic entry see Field 5B.

A FIELD STUDY OF PHYSICO-CHEMICAL STATES OF ARTIFICIAL RADIONUCLIDES IN SEAWATER,

National Inst. of Radiological Sciences, Chiba (Japan). Dept. of Environmental Contamination. For primary bibliographic entry see Field 5B. W75-11022

RETENTION OF CADMIUM IN MICE STUDIED BY WHOLE BODY AUTORADIOGRAPHY,

National Inst. of Radiological Sciences, Chiba (Japan). Div. of Training Schools.

J Radiat Res, Vol 15, No 2, p 107-110. 1974. Illus.

Descriptors: *Cadmium, *Pollutant identifications, *Rodents, Absorption. Identifiers: Mice, *Radiography.

The time-course of distribution of Cd (an environmental pollutant) in mice was investigated for up to 180 days after administration of 109Cd by whole body autoradiography and by radioactivity counting. Very little accumulated 109Cd was excreted from the body; it remained mainly in liver, kidneys and pancreas for a long time. The pattern of retention of 109Cd varied with organs: in liver, gastrointestinal wall and salivary glands, the concentration of 109Cd decreased with time in pancreas, spleen and lungs, it decreased very little; in kidneys, it increased. Liver retained a larger amount of 109Cd than any other organ even after a long period. In kidneys, most of 109Cd was retained in the cor-tex.-Copyright 1974, Biological Abstracts, Inc. W75-11024

RELATIONS BETWEEN ALGAL POPULA-TIONS AND THE PH OF THEIR MEDIA, Bor Ilan Univ., Ramat-Gan (Israel), Dept. of Life

Sciences. For primary bibliographic entry see Field 5C. W75-11028

PATHOGENIC FREE-LIVING AMOEBAE IN ARKANSAS RECREATIONAL WATERS,

Arkansas Univ., Fayetteville. Dept. of Zoology L. W. Bone, and D. A. Becker.

Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 709, \$3.25 in paper copy, \$2.25 in microfiche. Arkansas Water Resources Research Center, Fayetteville, Completion Report, 1975. 9 p, 1 tab, 11 ref. OWRT A-028-ARK(1), 14-31-0001-5004.

Descriptors: *Arkansas, *Recreation, Animal populations, Water quality, Animal pathology, Cultures, *Pollutant identification, *Pathogenic bacteria, Isolation, Human diseases. Identifiers: *Pathogenic anoebic, *Amoebae population density, Species diversity,

Pathogenic strains(Amoebae).

Selected recreational waters of Arkansas were sampled for pathogenic free-living limax amoebae. Water quality parameters were determined for recorrelation with amoebic population densities and species diversity. Cultural criteria and animal inoculation revealed no pathogenic strains. The feasibility of introduction and/or induction of pathogenic amoebic strains by environmental factors necessitates further ecological investigations.

DEVICE FOR AUTOMATIC DETERMINATION SUSPENDED SOLIDS CONTENT IN WATER,

Agency of Industrial Science and Technology. Tokyo (Japan). (assignee) H. Sunahara, Y. Ishihara, and N. Nakayama.

U.S. Patent No 3,893,333, 6 p, 6 fig, 1 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 469, July 8, 1975. Descriptors: *Patents, Water quality, *Water quality control, *Water pollution control, Water purification, *Suspended solids, Sampling, Automation, Measurement, *Pollutant identification.

The device for the automatic determination of the suspended solids content of water comprises a sample liquid collection unit, a specimen preparation unit, a filter paper feeding unit, a filter paper transfer unit, a suspended solids filtration unit, a drying unit, a weighing and display unit and a process control unit. All processes are automatic. All steps of operation are carried out by having relevant mechanisms automatically actuated by means of the timer of the automatic process control unit. Thus, the determination can be performed accurately and rapidly. Further, absence of manual operation serves to eliminate human error and ensures perfectly reliable determination. (Sinha-OEIS) W75-11063

MERCURY CONTENTS IN BIOLOGICALLY PRESERVED SPECIMENS OF MENUKE (SEBASTES BARAMENUKE AND S. FLAM-MEUS), Iwate Prefecture Fisheries Experimental Station,

Kamaishi (Japan).

S. Kamimura

Bulletin of the Japanese Society of Scientific Fisheries, Vol 41, No 4, p 487, April 1975. 1 tab, 2

Descriptors: Marine fish, *Metals, *Mercury, Laboratory tests, Analytical techniques, Environmental effects, *Pollutant identification.

Identifiers: *Menuke, Deep sea fish, Sebastes baramenuke, Sebastes flammeus, *Tissue analysis, *Bioaccumulation, Preserved fish, Atomic absorption spectrometry.

Five specimens of the deep sea fish, menuke (Sebastes baramenuke and S. flammeus), caught in 1939 and subsequently preserved in formaldehyde were analyzed for mercury content. Mercury content ranged from 0.05 to 0.88 mg/kg wet muscle in the specimens. Compared with recently caught menukes, there did not appear to be a significant difference in total mercury content in the preserved specimens. (Katz)

CONTINUOUS AUTOMATIC MONITORING OF

SURFACE WATER WITH FISH, Keuringsinstituut voor Waterleidingartikelen, Rijswijk (Netherlands).

C. L. M. Poels.

Water Treatment and Examination, Vol 29, part 1. p 46-56, 1975. 4 fig, 9 ref.

Descriptors: *Design, *Laboratory tests, *Water quality, *Toxicity, Electrical equipment, Environmental effects, Methodology, *Monitoring, Control systems, Rainbow trout, *Pollutant identifica-

Identifiers: *Flow-through systems.

An electronic system for registration of fish behavior and a flow-through system for continuous monitoring of surface water with fish were designed. Advantages of these systems were discussed including more sensitive criteria than death used for the indication of toxic substances, and faster detection of toxic substances. (Katz) W75-11079

INFLUENCE OF OIL ON NUCLEIC ACIDS OF

Institute of Biology of the Southern Seas, Odessa (USSR).

For primary bibliographic entry see Field 5C. W75-11080

EFFECTS OF SOME COMPONENTS OF CRUDE OIL ON YOUNG COHO SALMON, Alaska Univ., College. Dept. of Biological Sciences.

For primary bibliographic entry see Field 5C. W75-11088

THE USE OF SNAKES AS A POLLUTION IN-DICATOR SPECIES, Mesa Coll., Grand Junction, Colo. Dept. of Biolog-

ical Sciences

For primary bibliographic entry see Field 5B. W75-11089

MEASURES OF BIODEGRADABILITY AND REFRACTORY ORGANICS IN WASTE-WATERS: (ANALYSIS, INTERPRETATION, AND APPLICATION OF MEASUREMENT TECHNIQUES),

Connecticut Univ., Storrs. For primary bibliographic entry see Field 5D. W75-11103

THE WATER QUALITY AND BOTTOM SEDI-MENT CHARACTERISTICS OF NEW JERSEY LAGOON DEVELOPMENTS,

Rutgers - the State Univ., New Brunswick, N.J. For primary bibliographic entry see Field 5B. W75-11104

OXIDATION OF ORGANIC COMPOUNDS IN WATER (OXIDATION ORGANISCHER VERBINDUNGEN IN WASSER),

For primary bibliographic entry see Field 5D. W75-11118

NOTE ON THE MEASUREMENT OF THE RESPONSE OF OCEANOGRAPHIC TEMPERA-TURE SENSORS,

National Bureau of Standards, Washington, D.C.

For primary bibliographic entry see Field 7B. W75-11146

BEHAVIOR OF MN, FE, CU, ZN, CD AND PB DISCHARGED FROM A WASTEWATER TREATMENT PLANT INTO AN ESTUARINE ENVIRONMENT

Maryland Univ., College Park. Dept. of Chemis-For primary bibliographic entry see Field 5B. W75-11160

A STUDY OF FACTORS CONTROLLING THE CHEMICAL QUALITY OF WATER IN CART-WRIGHT CREEK BASIN, WILLIAMSON COUNTY, TENNESSEE,

Vanderbilt Univ., Nashville, Tenn. Dept. of Geology. For primary bibliographic entry see Field 2K. W75-11164

CONCENTRATION AND GENERA OF ALGAE IN SELECTED ILLINOIS STREAMS, 1971-1973,

Illinois State Water Survey, Urbana. S. D. Lin, R. L. Evans, and D. B. Beuscher. Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va 22161, as PB-244 819, \$4.25 in paper copy, \$2.25 in microfiche. Report of Investigation 80, 1975. 50 p, 2 fig, 3 tab, 18 ref.

Descriptors: *Pollutant identification, *Algae, *Uniface waters, *Illinois, Water quality, *Streams, Aquatic life, Diatoms, Phytoplankton, Cyanophyta, Chlorophyta, Nutrients, Water analysis, Plankton, Analysis, Chlorophyll, Analytical techniques, Eutrophication, Aquatic microorganisms, Seasonal.

Identifiers: *Algae type, *Algae density, *Algae composition, Diversity index, Desmid, Flagel-

During the period October 1971 to September 1973, samples of water from 35 Illinois streams at 41 locations were collected monthly and examined to determine the type, genera, and concentration of algae. Data for the 2-year period have been evaluated for algal density, composition, diversity indices, and seasonal succession for each location. Most stations had algal densities of from 500 to 2000 cts/ml, had between 15 and 24 different algal genera (41 genera total), and had a diversity index equal to or greater than 1.10. Stations on the Fox, Des Plaines, and Kaskaskia Rivers had algal densi-ties in excess of 5000 cts/ml. This report should be useful to persons responsible for developing, regulating, or managing water resources in Illin (Henley-ISWS) W75-11165

SPECIFIC CONDUCTANCE METHOD FOR IN SITU ESTIMATION OF TOTAL DISSOLVED

Northern Forest Research Center, Edmonton (Alberta)

T. Singh, and Y. P. Kalra.

Journal of the American Water Works Association, Vol 67, No 2, p 99-100, February 1975. 1 fig, 4

Descriptors: *Specific conductivity, *Dissolved solids, *Water analysis, *On-site tests, *Conductivity, Water properties, Electrical conductance, Physical properties, Evaluation, Analytical techniques, Estimating, Instrumentation, Canada, Testing procedures, Chemistry, Statistical models, Mineralogy, Ions.

Two methods are commonly used for determining total dissolved solids in water. Another method was proposed - determination by means of electrical conductance measurement. An excellent relationship was discovered between specific conductance and total dissolved solids of mountain streams. (Henley-ISWS) W75-11167

TI SI W

In

De

*Se Pol 2,4

cide

gan

pesi

tory Po

Pest disci

proc

knov

deriv

defin

perin lated

consi

samp

curre

tion,

are o

indivi

tant, e

to det

EVIDENCE OF ATMOSPHERIC TRANSPORT OF OZONE INTO URBAN AREAS, New York State Dept. of Environmental Conser-

vation, Albany. Div. of Air Resources. P. E. Coffey, and W. N. Stasiuk.

Environmental Science and Technology, Vol 9, No 1, p 59-62, January 1975. 6 fig, 5 ref.

Descriptors: *Ozone, *Pollutant identification, *Air pollution, Rural areas, Cities, Mixing, Advection, Path of pollutants, *New York, Spring, Summer, *Path of pollutants.

In late spring and continuing throughout the summer, concentrations of ozone in excess of 0.08 ppm are commonly found in rural areas of New York State. Widely separated rural sites measure similar ozone concentrations with very slight diurnal fluctuations. During episodes of high rural ozone concentrations, urban areas also experience high ozone peak concentrations, typically in the early afternoon. A transport and mixing hypothesis was made which interprets these urban ozone peak concentrations as primarily the result of the high background level of ozone and not local photochemical generation. (Sims-ISWS) W75-11169

AQUATIC WEED FIELD TEST PROGRAM USING A CO2 ELECTRIC DISCHARGE CON-VECTION LASER, Army Engineer Waterways Experiment Station,

Vicksburg, Miss.

P. A. Smith

In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 107-109, August 1974. Descriptors: *Aquatic weed control, *Irradiation, Radiation, Equipment, Design, Mechanical equipment, Pollutant identification. Identifiers: *Laser.

A field prototype closed-cycle carbon dioxide electric discharge convection laser was fabricated and tested. One end of the laser glass tube had a mirror with completely reflective material; the other end had a mirror with a 3/4 inch hole in the center which was sealed with a sodium chloride window to form a vacuum. The laser beam is formed when stimulated photons traveling along the axis of the glass tubing contain enough energy to be emitted from the sodium chloride window. The efficiency of the laser is 5 to 12%. Much of the input power is converted to heat. All of the components of the system generate heat (except the heat exchangers) which must be removed by cooling with water. The laser head consists of four discharge tubes through which the laser gas (4%) carbon dioxide, 39% nitrogen, 57% helium) circulates. Optical power is extracted using folded un-stable optics and transmitted to the atmosphere through the sodium chloride window. The availa-ble optical power is over six kilowatts and the design output power 2-4 kilowatts. Enclosures protect against shock, and plate glass shields protect the operator from reflected radiation. (See also W75-08289) (Buchanan-Davidson--Wisconsin) W75-11208

CHELATION STUDY OF COPPER (II): FULVIC ACID SYSTEM, Canada Centre for Inland Waters, Burlington

(Ontario).

For primary bibliographic entry see Field 5B. W75-11219

n,

ng

tri-

·la-

RT

ser-

1 9,

ion.

ring,

0.08 New

asure

diur

rural

ience n the othes-

ozone

of the

GRAM CON

tation.

erence control,

erways ippi, p

EXTRACTION AND ANALYTICAL TECHNIQUES FOR PESTICIDES IN SOIL, SEDIMENT, AND WATER, Wisconsin Univ., Madison. Water Resources

Centers, H. G. Pionke, and T. C. Daniel. In: 'Pesticides in Soil and Water,' Soil Science Society of America, Inc., Madison, Wisconsin, 1974, p 451-549. 18 tab, 291 ref, append.

Descriptors: *Pesticide residues, *Analytical techniques, *Sediments, *Soils, *Water, *Separation techniques, Persistence, DDE, DDT, Polychlorinated biphenyls, 2,4-D, Herbicides, 2,4,5-T, Dalapon, Dieldrin, Endrin, Heptaclor, Aldrin, Diquat, Paraquat, Monuron, Aliphatic pesticides, Carbamate pesticides, Thiocarbamate pesticides, Halogenated pesticides, Chlorinated hydrocarbon pesticides, Aroctors, Organophosphorus pesticides, Phosphothioate pesticides, Triazine pesticides, Uracil pesticides, U pesticides, Sampling, Chemical analysis, Labora-tory tests, Measurement, Reliability, Diazinon, *Pollutant identification, *Reviews, *Bibliographies.

Pesticide extraction and sample analysis is discussed without elaborating on specific procedures. Methodological design and evaluation is largely empirical, circumvents lack of knowledge, and compensates for the effect of unknown or illdefined relationships. Empirically derived and tested techniques must be clearly defined and are only valid under the original experimental conditions, and should not be extrapopermental conditions, and should not be extrapo-lated beyond limits imposed by those conditions without experimentation. Factors which must be considered prior to sample collection, methods for sampling soils, waters, and sediment; methods currently used to preserve samples; and extrac-tion, cleanup, and analysis of organic pesticides are discussed. Tabulated data defining and evaluating methodology for pesticide classes and individual compounds are presented riving extrac-individual compounds are presented riving extracindividual compounds are presented giving extrac-lant, extraction technique, fortification conditions to determine recovery efficiency of added pesti-cide, pesticide concentration in fortified sample,

equilibration time and conditions between fortification and extraction, sample pretreatment, and recovery values. Systemized monitoring is discussed. Development of methods and equipment for complex multi-residue analysis may have far-reaching effects of monitoring programs. An appendix gives the common and chemical names appendix gives the common and chemical names of organophosphorus insecticides, acidic pesticides, carbamate, substituted urea, uracil, benzonitrile, analides, analines, amide pesticides, and triazine and dipyridinium. (Buchanan-Davidson--Wisconsin)

THE UTILIZATION OF SUN-GLINT IN A STUDY OF LAKE DYNAMICS, Canada Centre for Inland Waters, Burling-

ton(Ontario).

ton(Ontario).

R. P. Bukata, and W. D. McColl.

In: Proceedings No 17, American Water Resources Association, Remote Sensing and Water Resources Management, p 351-367, 1973. 10 fig. 6 tab. 4 ref.

Descriptors: *Lakes, *Remote sensing, *Aerial photography, *Reflectance, Lake Ontario, Upwelling, Thermal properties, Circulation, Mass

Identifiers: *Sun-glint.

Features demarcated by mirror-reflected solar illu-mination (sun-glint) in aerial photographs of Lake Ontario and the role of sun-glint in evaluating the nature of dynamic processes occurring within the lake which display surficial characteristics is described. Under sun-glint conditions visible and infra-red photography may delineate dynamic in-terfaces between thermally different water masses. A time-sequential series should enable quantitative estimates of the nature of dynamic processes to be made. Sun-glint usage requires modification of surface solar reflective properties by lake dynamics. Imagery of upwelling areas indicated that surficial glitter patterns are induced when spatial variations of thermal time-gradients change. Such conditions are present in onset and decay phases of upwelling. Sun-glint discerned dynamics of river mouth thermal effluent injections, surface slicks, coastal mass transport, and lake circulation patterns if conditions were not in a dynamic equilibrium state. Sun-glint was used to evaluate the dynamics of the June 7, 1972 up-welling off the north shore of Lake Ontario. Using aerial photography and ground-truth data, it was concluded that spatial and temporal changes in thermal time-gradient are required to produce surface features discernable in sun-glint. (Bauchanan-Davidson--Wisconsin) W75-11239

PRELIMINARY INFORMATION ON THE NATURE OF ORGANIC MATTER IN THE SURFACE SEDIMENTS OF LAKES HURON, ERIE, AND ONTARIO, Canada Centre for Inland Waters, Burlington

For primary bibliographic entry see Field 2J. W75-11240

THE TOXICITY OF DRILLING FLUID COM-THE TOXICITY OF BRADZICE
PONENTS TO AQUATIC BIOLOGICAL
SYSTEMS, A LITERATURE REVIEW,
Marine Service, Winnipeg

For primary bibliographic entry see Field 5C. W75-11266

OBSERVATIONS SOME CONCERNING

SOME OBSERVATIONS CONCERNING PREPARATION AND STORAGE OF STREAM SAMPLES FOR DISSOLVED INORGANIC PHOSPHATE ANALYSIS, Cornell Univ., Ithaca, N.Y. Dept. of Agronomy. A. H. Johnson, D. R. Bouldin, and G. W. Hergert. Water Resources Research, Vol 11, No 4, p 559-562, August, 1975. 3 fig, 9 ref, 4 tab.

Descriptors: *Water analysis. *Phosphates, *Storage, Time, Inorganic compounds, Analytical techniques, Water pollution sources, Trace elements, Water pollution, Phosphorus compounds, Water properties, Freezing, Refrigeration, Pollution identification, New York.
Identifiers: Fall Creek(NY).

The influence of storage conditions and duration of storage was studied by using about 100 stream samples from Fall Creek collected near Ithaca, New York. Freezing and refrigerated storage were unsatisfactory, since changes in measured concentrations were usually observed after relatively short periods of time (24 hr). An isobutanol extracsnort periods of time (24 hr). An isobutanol extraction procedure is described which minimizes storage problems and is useful for routine analysis of water samples for dissolved inorganic phosphate. (Witt-IPC) W75-11336

DETERMINATION OF CHEMICAL OXYGEN DEMAND, COD(CR), IN WASTE WATERS OF PULP AND PAPER MILLS (BESTIMMUNG DES CHEMISCHEN SAUERSTOFFBEDARFES, CSB(CR), IN RESTABWAESSERN VON ZELL-STOFF UND PAPIERFABRIKEN).

English translation of Wochenblatt fur Papier-fabrikation, Vol 103, No 9, p 326-327, May 15,

Descriptors: *Pulp wastes, *Water analysis, *Chemical oxygen demand, *Testing procedures, Testing, Analytical techniques, Sampling, Water quality, Water pollution, Water pollution sources, Pollutant identification.

Identifiers: *Potassium dichromate.

This proposed method for COD determination by means of dichromate is not identical with the DEV means of distributions are the first than the DEV (Deutsche Einheitsverfahren zur Wasser-, Abwasser- und Schlammuntersuchung) H 4.2 standard method and is to be used only if control experiments show agreement with that method, which has been officially approved. (Ward-IPC)

INTERFERENCE OF MERCURY(II) IN THE COLORIMETRIC DETERMINATION OF INOR-GANIC PHOSPHATE IN WATER,

Massey Univ., Palmerston North (New Zealand). R. W. Tillman, and J. K. Syers.

The Analyst, Vol 100, No 1190, p 322-324, May, 1975. 7 ref. 2 tab.

Descriptors: "Water analysis. "Phosphates, *Mercury, "Colorimetry, Inorganic compounds, *Analytical techniques, Chemical analysis, Water pollution sources, Trace elements, Water pollu-tion, Chemical precipitation, Phosphorus com-pounds, Water chemistry, Water properties, Water quality, *Pollutant identification.

Mercury(II) caused a significant positive interference in the colorimetric determination of inorganic phosphate in the range 0-0.080 micro-gram/liter by the procedure of Murphy and Riley. The interference resulted from the formation of a precipitate that varied in particle size and was not always visible to the naked eye. With higher levels of inorganic phosphate (0.800 microgram/liter) a coarse precipitate formed that partially removed the molybdophosphate complex ion from solution. Elimination of this interference was achieved by complexing the mercury(II) with chloride or thiosulfate. (Witt-IPC) W75-11340

MODIFICATION OF THE IODIMETRIC TITRATION METHOD FOR THE DETERMINA-TION OF BROMIDE AND ITS APPLICATION TO MIXED DOMESTIC-INDUSTRIAL WASTE

National Environmental Research Center, Cincinnati, Ohio. Methods Developments and Quality Assurance Research Lab.

Group 5A-Identification Of Pollutants

D. F. Bender. The Analyst, Vol 100, No 1191, p 400-404, June, 1975. 5 ref. 2 tab.

Descriptors: *Waste water(Pollution), *Water analysis, *Volumetric analysis, *Bromides, *Analytical techniques, Chemical analysis, Water pollution sources, Hydorgen ion concentration, Instrumentation, Municipal wastes, Industrial wastes, Wastes, Iodides, Halogens, *Pollutant identification.

The iodimetric titration method for the determination of bromide involves the observation of various color changes, making the method unsuitable for use with samples that are highly colored. A modification is described, which extends the usefulness of the method to highly colored samples, such as sewage and industrial effluents. A pH meter was substituted for indicators and the use of standardized concentrations and amounts of reagents was incorporated into the method. The procedural steps were studied in order to optimize the sensitivity while minimizing interfering side reactions. The modified method was applied to a mixed domestic-industrial effluent spiked with bromide and iodide. The experimental details and statistical parameters for samples spiked at dif-ferent levels are presented. (Witt-IPC) W75-11341

APPARATUS FOR CONCENTRATION VOLATILE ORGANIC POLLUTANTS

Tekmar Co., Cincinnati, Ohio.

J. O. Grote.

American Laboratory, Vol 7, No 7, p 47-48, 50, July, 1975. 7 fig, 3 ref.

Descriptors: *Organic compounds, *Water analysis, Pollutant identification, *Instrumentation, Analytical techniques, Water pollution sources, Trace elements, Sampling, Water chemistry, Water properties, Waste water(Pollution), Potable

In the liquid sample concentrator described, produced by Tekmar Company, an inert gas is bubbled through a water sample containing or-ganic compounds. The volatile organics exhibiting low solubility in water are quantitatively parti tioned into the gas phase, and the gas is passed through a trap that retains the organics but allows the water vapor and the purge gas to pass through. The concentrated sample is passed to a measuring instrument. By varying the type of adsorbent in the trap, the specificity of the technique can be changed to accommodate various classes of organic compounds. Data are presented illustrating the recovery of organic compounds such as acetone, methylene chloride, chloroform, carbon tetrachloride, and benzene from spiked water and drinking water. The apparatus is a useful tool for the analysis of volatile organic pollutants in water at the parts-per-billion level. Its compatibility with existing gas chromatographs and detector systems makes it adaptable to a variety of gas chromatographs and measurement devices. (Witt-IPC) W75-11342

INTERFERENCE OF SULFATE ION ON SPADNS (SODIUM 2-(SULFOPHENYLAZO)-1,8-DIHYDROXYNAPHTHALENE-3,6-DISUL-FONATE) COLORIMETRIC DETERMINATION OF FLUORINE IN WASTE WATERS,

Calgon Corp., Pittsburgh, Pa. Calgon Labs. R. F. Devine, and G. L. Partington. Environmental Science and Technology, Vol 9,

No 7, p 678-679, July, 1975. 4.ref.

Descriptors: *Waste water(Pollution), analysis, *Colorimetry, *Sulfates, *Fluorides, Analytical techniques, Chemical analysis, Electrodes, Ions, Water pollution sources, Trace ele ments, Water chemistry, Water properties, Water pollution, *Pollutant identification. Identifiers: Sodium 2-(sulfophenylazo)-1,8dihydroxynaphthalene-3,6-disulfonate.

The approved method for the determination of fluoride ion is the SPADNS colorimetric procedure preceded by distillation from a sulfuric acid solution. This procedure is based upon the measurement of the loss of color of a zirconiumdye lake owing to the reaction of fluoride ion with zirconium to form a colorless complex ion. The dye used is sodium 2-(p-sulfophenylazo)-1,8-dihydroxynaphthalene-3,6-disulfonate (SPADNS). Serious errors in this method are caused by sulfate ion carry-over from the initial distillation step. The use of a fluoride ion electrode is suggested as a better method. (Witt-IPC) W75-11343

CHROMATOGRAPHIC DETERMINATION OF PHENOLS IN WATER,

Ames Lab., Iowa. C. D. Chriswell, R. C. Chang, and J. S. Fritz. Analytical Chemistry, Vol 47, No 8, p 1325-1329, July, 1975. 2 fig, 3 tab, 13 ref.

Descriptors: *Water analysis, *Phenols, *Anion exchange, *Gas chromatography, Separation techniques, Analytical techniques, Chemical analysis, Natural streams, Potable water, Water chemistry, Water properties, Water quality, Water pollution sources, Pollutants, *Pollutant identifi-cation, Organic compounds, Resins, Ion exchange, Chromatography, Oxidation, Chlorina-Identifiers: A-26 resin, Chlorinated phenols.

Phenols in natural waters and treated drinking water are determined by sorption on macroporous anion-exchange resin (A-26 resin from Rohm and Haas Chemical Company), elution with acetone, and measurement by gas chromatography. Techniques are given for preventing phenol losses caused by chlorination, oxidation, and other reac-tions during their determination. Common inorganic ions and many organic substances cause no interference; neutral organics that are retained by the resin can be removed by a methanol wash. The method gives accurate results for phenol, alkyl-, and chloro-substituted phenols in the parts/billion to parts/million concentration range. (Witt-IPC) W75-11344

5B. Sources Of Pollution

EXPERIMENTAL STUDY OF THE COOLING WATER SYSTEM, SETUBAL POWER PLANT, RIO SADO, PORTUGAL.

Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering. G. Jirka, J. Lee, and D. R. F. Harleman.

Ralph M. Parsons Laboratory for Water Resources and Hydrodynamics, Report No 185, April 1974. 101 p, 24 fig, 4 tab, 7 ref.

Descriptors: *Powerplants, *Design criteria, Optimum development plans, *Cooling water, Hydraulic models, Channels, *Discharge(Water), Thermal pollution.

Identifiers: *Portugal(Rio Sado), Once-through cooling system, Cooling water systems.

The Setubal power Plant is a fossil fueled generating station located on the Rio Sado in Portugal. It employs a once-through cooling system. The ob-jective was to arrive at an optimal design for the cooling water system with respect to two criteria: (1) minimization of heat recirculation at the cool water intake and (2) small surface velocities in the vicinity of the discharge zone to avoid any hazard to navigation. Two designs for the condenser discharge were considered: discharge by means of a surface channel and discharge by means of a submerged multiport diffuser. The intake design is a skimmer wall that selectively withdraws cooling water from the ambient stratified water. Existing

theoretical models were used to obtain preliminary estimates of design parameters. A hydraulic scale model for the discharge-intake zone was constructed. Tests were carried out to investigate the variability of the criteria of concern to the design parameters under the full range of ambient conditions. Based on the results of the experiments, a surface discharge channel is recommended as an optimal design for the cooling water system. Experimental data for both the surface discharge and the submerged diffuser were compared with exist-ing mathematical models. W75-10855

OCCURRENCE OF 2, 4, 5-T AND PICLORAM IN SURFACE RUNOFF WATER IN THE BLACKLANDS OF TEXAS,

Agricultural Research Service, College Station, Tex.

R. W. Bovey, E. Burnett, C. Richardson, M. G. Merkle, and J. R. Baur.

Journal of Environmental Quality, Vol 3, No 1, p 61-64, January-March, 1974. 8 tab, 12 ref.

T

lo Re

III

De tio

Dis Ter wa

The

par pre

is a

gen soh

the

tem stre

met

THE

LAK

OTH

Was

raph

Limi

GI 33

*Ars

arsen Inorg

Evalu

try, pertic

prope Dusts

identi

Identi

Copp

Descriptors: *2-4-5-T, *Runoff, *Irrigation water, *Return flow, Rainfall, Streams, Small watersheds, Water sources, Texas, *Path of pollutants, Water pollution sources.
Identifiers: *Picloram, Texas blacklands.

A study was made to determine the amount of 2, 4, 5-T and picloram in surface runoff water from pastures and rangeland sprayed with the herbicides as a result of major rainfalls following treatments. Soil, grasses, and runoff water were analyzed periodically following herbicide treat-ment. Herbicide content in the soil remained low throughout the investigation. Herbicide content on grass was high immediately following treatment, grass was high influentary following teatment, but degraded rapidly. Plant washoff was the main source of the herbicide in runoff water. Concen-trations were moderately high if heavy rainfall oc-curred immediately after herbicide treatment, but were low if major storms occurred one month or longer after the treatment. No damage occurred to cotton or sorghum located adjacent and below the herbicide-treated watersheds from either spray drift or surface runoff water. (Mastic-Arizona) W75-10895

TWO-DIMENSIONAL, HYDROSTATIC SIMU-LATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS, Stanford Univ., Calif. Dept. of Civil Engineering.

For primary bibliographic entry see Field 2H.

FLOOD RUNOFF FROM URBAN AREAS, Maryland Univ., College Park. Dept. of Civil En-R. H. McCuen.

Available from the National Technical Informa-Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-244 504, \$4.75 in paper copy, \$2.25 in microfiche. Maryland Water Resources Research Center, College Park, Technical Report No. 33, June 1975, 70 p. OWRT A-025-MD(2), 14-31-0001-5020.

Descriptors: Simulation analysis, Path of pollutants, *Urban hydrology, *Storm water, Management, *Storage, Land use, Water quality, Floods, Runoff, Cities, Urbanization, Forecasting, Estimating, *Peak discharge, *Design floods, *Runoff forecasting, Model studies.

This study examined several important aspects of urban water resources management and resulted in the following: (1) a set of prediction equations that can be used to estimate different land use characteristics from selected demographic charac-teristics; (2) a set of design curves relating peak discharge and the land use intensity rating, as a function of the exceedence probability (i.e., return period); (3) a set of design curves showing the ef-fect of rooftop detention on peak discharge for

Sources Of Pollution-Group 5B

various land use intensity ratings and exceedence probabilities; (4) a computer model of a storm water detection facility; (5) a model study com-pared the effect of the individual-site approach to the regional approach to storm water detention; (6) a set of design curves that can be used in the design of storm water detention facilities for areas characterized by high concentrations of impervious areas (e.g., streets and parking lots); (7) a water quality simulation model that can predict the level of eight pollutants in runoff from urban and suburban streets; (8) a set of prediction equations that can be used to predict water use of selected commercial establishments.

A COMPUTER PROGRAM PACKAGE FOR AQUATIC ECOLOGISTS, Cornell Univ., Ithaca, N.Y.

For primary bibliographic entry see Field 2H.

THERMAL RESPONSE OF HEATED STREAMS, SOLUTION BY THE IMPLICIT

lowa Univ., Iowa City. Inst. of Hydraulic Research.

Research. P. P. Paily, and E. O. Macagno. IIHR Report No. 165, May 1974. 71 p, 10 fig, 1 tab, 23 ref, 2 append. NSF Grant GK-35910X.

Descriptors: *Path of pollutants, *Thermal pollu-Descriptors: Frain of poliutants, Therma poliu-tion, "Ice cover, "Numerical analysis, "Mathematical models, "Mississippi River, Dispersion, Rivers, Winter, Analysis, Equations, Temperature, Distribution, Effuents, Heated water, Discharge(Water), Diffusion.

The thermal response of natural streams to artificial heat inputs from thermal power stations was mathematically represented by the one-dimen-sional convection-diffusion equation, for fully mixed flow conditions. The unsteady one-dimen-sional convection-diffusion equation is a nonlinear parabolic partical differential equation, due to the presence of the surface heat exchange term which is a complex function of the water temperature. In general, it has been difficult to obtain closed-form solutions of this governing equation by analytic methods. A numerical solution, utilizing a predic-tor-corrector scheme, was developed to predict the transient-period as well as the steady-state temperature distributions in thermally loaded streams under changing thermal input rates and meteorological conditions. An example case was solved for several different conditions and the results were presented. (Adams-ISWS) W75-10909

THE GEOCHEMICAL CYCLE OF ARSENIC IN LAKE WASHINGTON AND ITS RELATION TO OTHER ELEMENTS,
Washington Univ., Seattle. Dept. of Oceanog-

E. A. Crecelius.

ED

En-

ma-504.

ark, VRT

nage-

Esti

unoff

cts of s that

harac-

peak

, as a return

the ef-

Limnology and Oceanography, Vol 20, No 3, p 441-451, May 1975. 3 fig, 2 tab, 29 ref. NSF Grant

Descriptors: *Washington, Path of pollutants, *Arsenic compounds, *Lake sediments, *Sodium arsenite, Analytical techniques, *Water analysis, Inorganic compounds, Separation techniques, Evaluation, Neutron activation analysis, Chemis-Ty, Instrumentation, Sediments, Chemical properties, Chemical analysis, Aluminum, Biological properties, Fron, Manganese, Geochemistry, Dusts, Rainfall, Suspended solids, Pollutant identification, Identifiers: *Lake Washington(Wash), Antimony,

Copper smelter.

Abnormally high arsenic concentrations (greater than 200 ppm dry weight) in the surface sediments of Lake Washington are attributed to atmospheric

input of partially soluble arsenic-rich dust from a copper smelter 35 km upwind and removal of dissolved As from the lake water by bacteria on an inorganic reaction. The suspended matter in the deeper lake water contains 9% iron, 8% manganese, and 350 ppm arsenic. Cores dated by Pb210 indicate that As levels began to increase in the sediments when the smelter began operation in 1890. An arsenic budget for the lake shows equal supplies from the atmosphere and from rivers, and removal by outflowing water (45%) and by accumulation in the sediments (55%). A similar cycle was observed for antimony which is released by the smelter in much smaller amounts than arsenic. About two-thirds of the As in rain and lake water was in the form of arsenate; however, in the in-terstitial water 55% of the dissolved As was present as arsenite and a few percent as dimethylarsinic acid. (Henley-ISWS)

SURFACE TENSION REDUCTIONS AND URBAN WASTES IN THE NEW YORK BIGHT, State Univ. of New York Stony Brook. Marine

Sciences Research Center.

C. D. Hardy, and E. R. Baylor. Journal of Geophysical Research, Vol 80, No 18, p 2696-2699, June 20, 1975. 1 fig, 21 ref.

Descriptors: *Path of pollutants, *Surface tension, *Surfactants, Water properties, *Monomolecular films, New York Properties, Tension, Surfaces, Wettability, Detergents, Water pollution sources, Sewage sludge, Water quality, Sea water, Sludge disposal, Films, Waste disposal, Sewage effluents,

Pollutants, Metals, Aerosols, Identifiers: *Urban wastes, *New York Bight, *New York Harbor, Oil drop method, Lipophilic pollutants, Metallic pollutants.

The distribution of surface tension in the New York Bight was calculated from oil drop spreading measurements at sea. Reductions in surface tensions of greater than 30% (less than 50.9 dyn/cm) of that calculated for clean seawater were as-sociated with sewage sludge dumping and urban waste discharges. The potential role of surface films as an agent in the transport of metallic and lipophilic pollutants was briefly discussed. (Henley-ISWS)
W75-10927

QUALITY OF WATER IN AQUIFERS OF THE AMARGOSA DESERT AND NEVADA,

NEVADA, Geological Survey, Denver, Coio. B. P. Robinson, and W. A. Beetem. Available from National Technical Information Service, Springfield, Va 22161 as USGS-474-215 (NTS-123), \$5.45 in paper copy, \$2.25 in microfiche. Report USGS-474-215 (NTS-123), 1975. 64 p, 1 fig, 1 tab.

Descriptors: *Water pollution sources, *Groundwater, *Nuclear explosions, *Nevada, Water quality, Water wells, Pumping, Aquifers, Chemical analysis, Data collections, Sampling. Identifiers: *Nevada Atomic Test Site.

The U.S. Geological Survey has interpreted the rate and direction of groundwater movement away from the Nevada Atomic Test Site by using hydrologic data including results of hydraulic tests and geophysical surveys in deep wells. Samples of water were collected from 25 sources including supply wells, irrigation wells, and springs in the Pahrump, Amargosa, and Indian Springs In the Pahrump, Amargosa, and Indian Springs Valleys and at the Nevada Test Site during a single sam-pling sweep. Analyses in the field indicated that the composition of the pumped or discharging water approximated the composition of the aquifer water. The composition of the water did not change with extended pumping time. On-site ex-amination of the samples of water included mea-surement of specific conductance, temperature, pH, dissolved oxygen, dissolved carbon dioxide, alkalinity, and ferrous-ferric iron ratios. Laboratory examination of the samples included chemical, radiochemical, and spectrochemical analyses.
(Woodard-USGS)

HEAVY METALS AND OTHER TRACE ELE-MENTS.

MENTS, Geological Survey, Menlo Park, Calif. H. V. Leland, E. D. Copenhaver, and D. J. Wilkes. Journal Water Pollution Control Federation, Vol 47, No 6, p 1635-1656, June 1975. 1 tab, 201 ref.

Descriptors: *Water pollution sources, *Heavy metals, *Trace elements, *United States, *Reviews, Surface waters, Sediments, Rivers, Estuaries, Natural streams, Ecosystems, Biological communities, Marine biology.

This literature review describes the effects of heavy metals and trace elements in surface waters of the United States under the following headings: (1) Trace Elements in Natural Waters; (2) Trace Elements in Sediments; (3) Physical-Chemical Forms of Trace Elements; (4) Trace Element Partitioning in Aquatic Ecosystems; and (5) Bioaccumulation and Toxicity of Trace Elements. Scattered and intensive chemical surveys of natural waters in the U.S. continue to show that many trace elements, including As, Cd, Pb, Hg, and Zn, are widely distributed but at low concentrations relative to the limits established for drinking waters. The geographic distributions of Cd, Pb, and Zn have distinct regional patterns. Pollution sources and rainfall are apparently the major con-tributors of Cd and Pb in river water. (Woodard-USGS)

REVIEW OF CONFERENCE ON HYDROLOGY OF DEEP SEDIMENTARY BASINS, Tulsa Univ., Okla. Dept. of Earth Sciences.

P. A. Dickey, and P. H. Jones. American Association of Petroleum Geologists Bulletin, Vol 59, No 7, p 1198-1201, July 1975.

Descriptors: "Sedimentology, "Hydrology, "Geology, "Reviews, "Conferences, Groundwater, Subsurface waters, Hydrogeology, Groundwater movement, Sediments, Oil-water interfaces, Sediment-water interfaces, Permeability, Oil shales, Evaluation, Water pollution, Oil pollutions Identifiers: *Deep sedimentary basins.

The conference on Hydrology of Deep Sedimenta-ry Basins sponsored by the American Association of Petroleum Geologists (AAPG) was held at Shangri-la resort, Afton, Oklahoma, October 7-11, 1974. Participants numbered 60, and included representatives from oil company laboratories, government bureaus, and universities. The con-ference produced an interesting difference of opinion on the movement of deep subsurface waters. Most of the hydrologists present, and some of the petroleum geologists, believe that deep subsurface pore waters are moving both parallel with and perpendicular to bedding planes. The movement is caused by the compaction of sediments, phase changes in the minerals, and head differences caused by topography. These people believe that the salt in subsurface brines was concentrated by reverse osmosis, that hydrodynamically tilted water-oil contacts are common, and that updip or downdip flows of water in sandstones can enhance or destroy petroleum traps. Others believe that shales com-monly lose all their permeability to water, at least in a direction perpendicular to the bedding. (Woodard-USGS)

USE OF PRODUCTIVITY OF PERIPHYTON TO ESTIMATE WATER QUALITY,
Geological Survey, Menlo Park, Calif.
L. J. Tilley, and W. L. Haushild.

Group 5B-Sources Of Pollution

Journal Water Pollution Control Federation, Vol. 47, No 8, p 2157-2171, August 1975, 8 fig, 4 tab, 29

Descriptors: "Water quality control, "Path of pollutants, *Waste water disposal, *Washington, Streams, Estuaries, Methodology, *Periphyton, Growth rates, Chlorophyll, Nutrients, Phosphates, Ammonia, Nitrates, Water quality, Streamflow, Flow rates, *Bioindicators, Pollutant identification.
Identifiers: *Duwamish-Green River(Wash).

In a comprehensive study of the effects of changes in wastewater disposal practices on the Duwamish River (Wash.) estuary, the amount and rate of change of chlorophyll a was used to determine the net primary productivity of the periphyton growing upstream from the estuary in the Duwamish Green River. The net primary productivity varied among three stream environments sampled in the study during the summer and fall of 1969. Net primary productivity averaged 3.6 mg/wk/sq m in a mountainous reach, increased to 6.2 in a lowland reach, and was as much as 17.5 in an estuarine reach. The productivity of periphyton was related to concentration of selected nutrients (nitrate. nitrite, ammonia, and phosphate) in the stream The small temperature changes along the stream probably had a minor influence on the differences in periphyton growth rates. (Woodard-USGS)

ILLINOIS LANDFILL LAW MAY EFFECT NEARBY STATES.

Solid Wastes Management, Vol 17, No 8, p 36, 46, 58, 72, 78-79, August, 1974.

Descriptors: *Landfills, *Solid wastes, *Waste disposal, *Legislation, *Illinois, Regulation, permits, Environmental sanitation, Water pollution sources, Water pollution control.

The Pollution Control Board of Illinois was developed a broad-based policy on the control of landfill operations. The key provision states that no person in any state may allow a sanitary site to maintained so as to threaten or permit the discharge or emission of pollutants into the en-vironment so that they may in any way contaminate the air and/or water within the state of Illinois. This means that any individual or organiza-tion that is in violation of the law is liable for his act even though the initial polluting may have occurred outside of the state of Illinois. An outline of the legislation is presented. Subjects covered include permits, methods of operation, type of wastes that may be deposited, features that must be included in a landfill site, and items that must be contained in an application for a landfill permit.
Development permits are required for the development of any new solid wastes management site or for the modification of an existing site. Operating permits are required to operate a site. Experimen-tal permits will be issued for methods that do not satisfy the current standards if the applicant can show proof that the method has a reasonable chance for success and that there are minimal environmental hazards. (Orr-FIRL) W75-11011

PREVENTING BACKFLOW IN PIPING CROSS CONNECTIONS, Watts Regulator Co., Lawrence, Mass.

J. F. Keegan.

Plant Engineering, Vol 29, No 8, p 229-231, April 17, 1975. 6 fig, 2 tab.

Descriptors: *Water pollution sources, *Potable Pipes, Water supply

Identifiers: Cross connections, Piping, Backflow.

Inadvertent contamination of potable water supplies may be avoided by preventing backflow in piping cross connections. Two types of uncon-trolled cross connections which permit unwanted reverse flow are back siphonage and backpressure. Siphonage occurs when a water supply system is subjected to an unexpected pressure drop. Backflow from backpressure results when a system component such as a pump or a boiler under pressure produces a pressure exceeding that of the water supply main. In some cases, a com-bination of back siphonage and backpressure cause backflow. To overcome the possibility of contamination by backflow, in-plant cross connec-tion control programs should be implemented. Backflow prevention devices are described. These cross connections are either the inlet type or the pressure type. In the inlet type, the connection is used for filling a receptacle open to the at-mosphere while in the pressure type, water supply is connected to another line or to a pressurized vessel. In the latter, connections are often fitted with shutoff or check valves to isolate nonpotable systems from the potable supply. Selection of the proper prevention device depends upon the type of cross connection to be connected and the degree of hazard existing. (Prqgue-FIRL) W75-11018

STABILITY OF NITROSAMINES IN SAMPLES OF LAKE WATER, SOIL, AND SEWAGE, Cornell Univ., Ithaca, N.Y. Lab. of Soil

Microbiology.
R. L. Tate, III, and M. Alexander.
Journal of the National Cancer Institute, Vol 54,

No 2, p 327-330, February, 1975. 5 fig, 17 ref. Descriptors: *Nitrogen compounds, *Soil environment, "Sewage, "Lakes, Water pollution sources, Microbial degradation, Persistance, Pollutant identification, Laboratory tests, Testing, Public

health, *Path of pollutants Identifiers: *Nitrosamines, *Carcinogens.

Interest in nitrosames is prompted because of their possible carcinogenic, teratogenic, and mutagenic properties. Their possible synthesis in fresh waters, polluted waters, and soil is of some concern because the precursors are widespread. The significance of the formation of N-nitroso compounds depends upon the stability of these carcinogens in natural systems and their possible entry into public water supplies, fish, and edible plants. This study assessed the stability of simple (N-nitrosodimethylamine, nitrosodiethylamine, and N-nitrosadi-n-propylamine) in lake water, soil, and sewage. No degradation of these nitrosamines was observed in lake water during a 3.5 month period. A slow dis-appearance was noted in soil after a lag of several weeks. The loss was more rapid in sewage, but even after two weeks more than half of the nitrosamine remained. The results of the experi-ments of sewage and soil suggest a microbial in-volvement in the slow decomposition of the nitrosamines. (Orr-FIRL)

SOME OBSERVATIONS ON BEHAVIOR OF THE TREATED SEWAGE DISPOSED IN THE

Nihon Univ., Tokyo (Japan). Dept. of Fisheries. D. Inaba, S. Arazaki, H. Murooka, Y. Deguchi, and S. Kadota.

Bulletin of the College of Agriculture and Veterinary Medicine, Nihon University, No 31, p 54-78, 1974. 15 fig, 8 tab, 4 ref.

Descriptors: "Sludge disposal, "Oceans, *Environmental effects, Marine animals, Analytical techniques, Sewage treatment, Monitoring, Pollutant identification, Water quality control, Ul-timate disposal, *Path of pollutants, Dispersion,

Identifiers: Pollutant dispersal, *Japan,

A survey of marine disposal of sludge from sewage treatment was conducted in Japan, in order to obtain information on dispersal characteristics in the ocean and to detect effects of this disposal method on water quality and marine life. Color differentiation between sludge water surface and clean water areas was observed just after introduction of the sludge. Vertical sedimentation rate was measured by optical monitoring through marine television, echo sounder devices, and an underwater illuminometer. Particles precipitated into the water at different rates of descent due to specific gravity and differences in particle shape. Water quality analysis was done in relation to ammonia density, BOD, and pH parameters, indicating that these factors did not cause any significant qualitative changes to the environment. Strong winds and high waves provided a rapid dispersal and mixing of the sludge in the aquatic environment. These rapid mixing and dispersal factors are also illustrated by an unexpectedly low general and coliform bacteria count. (Prague-FIRL)

A FIELD STUDY OF PHYSICO-CHEMICAL STATES OF ARTIFICIAL RADIONUCLIDES IN

SA W M

Re K.

Av

tion 197

Des Wa

*Et

•Pa

Ide

Indi lake

Mas

alga

each

lake

estin copp

sulfa

than

throu

prese

colun

incor

biota.

coppe

on th

were :

follow

bottor

the wa

appare

from t

sulfate

lions in

copper

copper

the pe

W75-11

HYDR

PHENC Oklaho

For prin

National Inst. of Radiological Sciences, Chiba (Japan). Dept. of Environmental Contamination.

Journal of the Oceanographical Society of Japan, Vol 30, p 179-184, 1974. 1 fig, 3 tab, 15 ref.

Descriptors: *Radioactive wastes, *Fallout, Filters, *Radioisotopes, Oceans, Water pollution, Analytical techniques, *Radiochemical analysis, Pollutant identification, Water pollution sources, Identifiers: 90Sr, 137Cs, 144Ce, Marine pollution.

The behavior of artificial radionuclides in seawater has been shown to differ from the behavior of natural isotopes, at least within a duration of time after the artificial substances have been introduced into the sea. The physico-chemical states of artificial radionuclides 90Sr, 137Cs, and 144Ce in seawater were studied by radio-chemical analy sis of filtered and unfiltered seawater, in order to understand and predict the radioactive contamination of the marine environment. These fallout radionuclides were analyzed, and the difference of radionuclide concentrations between unfiltered and filtered seawater was defined as the particulate form radioisotope. A considerable amount of 144Ce was found to be particulate. Almost no 90Sr greater than 0.22 microns in size was observed in either coastal or open seawaters, but much 137Cs seemed to be insoluble in coastal waters. For the Kashima-nada area, the possible occurence of particulate radionuclides greater than 0.22 microns in size was estimated, and was found to one percent or less for 90Sr and 6 percent for 137Cs. In coastal water, 80 percent of 144Ce were in particulate form, but very little particulate 144Ce was found in the open seawater. The influence of suspended matter to 137Cs and 144Ce concentration levels in seawater is as yet undetermined. (Prague-FIRL) W75-11022

MERCURY CONTENT OF WHALES, (IN JAPANESE),

K. Nagakura, S. Arima, M. Kurihara, T. Koga, and T. Fujita.

Bulletin of the Tokai Regional Fisheries Laboratory, No 78, p 41-46, June 1974. 7 tab, 5 ref.

Descriptors: Aquatic animals, *Heavy metals, *Mercury, *Animal physiology, Path of pollutants, Food chains, Environmental effects, Water

pollution effects. Identifiers: *Whales, Fin whale, Sei whale, Sperm whale, Balaenoptera physalus, Balaenoptera borealis, Physeter catoden, *Methyl mercury, Bioaccumulation, Tissue analysis.

The mercury content of the meat of fin whale, Balaenoptera physalus, sei whale, B. borealis, and sperm whale, Physeter catoden, was determined. Total mercury content of the sei and fin whales (baleen whales) was 0.01-0.07 ppm and 0.01 - 0.03 ppm, respectively; methyl mercury content was

Sources Of Pollution-Group 5B

less than 0.008 ppm. Total mercury content of sperm whale, a toothed whale, was 0.65-1.57 ppm in North Pacific and 0.54-1.48 ppm in Antarctic samples, of which 70% in both areas was methyl mercury. The variance in mercury content was ascribed to the difference in feeding habits of the two whale types. (Katz) W75-11029

COPPER TOXICITY IN BUSYCON CANALICU-

Rhode Island Univ., Kingston. Graduate School of Oceanography.

For primary bibliographic entry see Field 5C. W75-11031

PRELIMINARY INVESTIGATIONS COPPER CYCLING IN INDIAN LAKE, MAS-SACHUSETTS: A LAKE TREATED ANNUALLY WITH COPPER SULFATE,

Massachusetts Univ., Amherst. Water Resources

Research Center K. H. Symmes.

al

nd

ed

IN

to-

Mu-

ater

erm

tera ury.

hale. and ined. hales

0.03 was Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 716, \$3.75 in paper copy, \$2.25 in microfiche. Publica tion No 47, Completion Report FY-75-2, April 1975. 37 p, 9 fig, 6 tab, 28 ref. OWRT A-064-MASS(1). 14-31-0001-4021.

Descriptors: Copper, *Massachusetts, Lakes, Water treatment, *Copper sulfate, *Eutrophication, *Water pollution treatment, Path of pollutants, Metals, Absorption, Lake ediments, Biota. Identifiers: *Indian Lake(Mass), Macrophytes

Indian Lake is a shallow, soft-water, eutrophic lake located within the city limits of Worcester, Mass. Its watershed is well-developed and since the early 1960's the lake has suffered from severe algal blooms. Copper sulfates has been applied each summer since then to control the problem. This study was undertaken to provide knowledge of copper concentrations and cycling in a treated lake. Copper inputs to Indian Lake included an estimated 14 kg soluble and 18 kg particulate copper from the watershed between Aug. 6, 1973, and Jan. 16, 1974, and 345 kg soluble from copper sulfate treatment during July and Aug. 1973. Less than 2% of the total copper input left the system through the lake outlet, approximately 2% was present in soluble and particulate form in the water column at any given time, and the remainder was incorporated into Indian Lake sediments and biota. The application of copper sulfate to Indian Lake was followed by rapid conversion of soluble copper to particulate forms which were deposited on the lake bottom. Conversion and deposition were approximately 90% complete by the 10th day following treatment. Although resuspension of bottom sediments did occur, release of copper to the water column from circulating sediments was apparently not extensive. Macrophytes in the shalw south basin of Indian Lake absorbed copper from the water following the application of copper sulfate. Subsequent declining copper concentrations in the plants may have been due to release of copper back into the water, but large increases in copper in the water adjacent to the plants during the period of declining plant copper concentra-tions were not observed. W75-11039

HYDRAULIC MODELING OF MIXING PHENOMENA IN STRATIFIED LAKES, Ollahoma State Univ., Stillwater, School of Mechanical and Aerospace Engineering. For primary bibliographic entry see Field 2H.

BIOCHROME ANALYSIS AS A METHOD FOR ASSESSING PHYTOPLANKTON DYNAMICS, PHASE II, Arkansas Univ., Fayetteville. Dept. of Botany and

For primary bibliographic entry see Field 5C. W75-11052

PROCESS STUDIES AND MODELING OF SELF-CLEANING CAPACITY OF MOUNTAIN CREEKS FOR RECREATION PLANNING AND

CREEKS FOR RECREATION PLANNING AND MANAGEMENT,
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.
C-L. Chen, and K. D. Devis.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 690, \$4.25 in paper copy, \$2.25 in microfiche. Utah Water Research Laboratory, Logan, Report PRWG135-1, June 1975. 79 p., 5 fig., 5 tab, 36 ref, 2 append. OWRT B-095-UTAH(1), 14-31-0001-4132.

Descriptors: *Dispersion, *Dissolved oxygen, Mathematical models, Mixing, *Reaeration, Turbulence, *Self-purification, Recreation, Planning, Management, Streams, *Utah, Model studies, Tracers, Dye dispersion, *Path of pollutants. Identifiers: Summit Creek(Utah), Mountain

Reaeration process studies were conducted on a mountain creek and a large laboratory flume. The method of evaluating the dispersion coefficient, mean velocity, and reaeration coefficient for both creek and flume consisted of finding these values for a deoxygenated portion of the flow containing a conservative tracer (dye). The deoxygenated slug is measured as it moves downstream and the three values are best fit in the analytical solution of the longitudinal dispersion equation which dynamically describes the flow of the dispersing slug in the stream. The best fit was accomplished by using the method of least squares in which the sum of squares of the differences between the dissolved oxygen and dye concentrations calculated from the dispersion equation and those obtained from the actual measurements is minimized. A reaeration coefficient prediction model of general form was developed. The model is composed of two dimensionless parameters which were dimensionless parameters identified from the normalized dissolved-oxygen balance equation. A simplified model which has two model parameters was also developed. Both model parameters were evaluated specifically for the mountain creek and laboratory flume. A comparison of this simplified model with existing models revealed that most existing models are in complete in form. Inclusion of the dispersion coefficient in the reaeration coefficient model improved the prediction accuracy. The information obtained from this study would aid in the determining of oxygen balance of mountain creeks which is essential to the resource management of mountain watersheds. W75-11055

A REEVALUATION OF THE COMBINED EF-FECTS OF TEMPERATURE AND SALINITY ON SURVIVAL AND GROWTH OF BIVALVE LAR-RESPONSE TECHNIQUES.

Oregon State Univ., Corvallis. School of Oceanog-

For primary bibliographic entry see Field 5C.

STANDARD CURVES FOR NUVACRON, MALATHION, SEVIN, DDT, AND KELTHANE TESTED AGAINST THE MOSQUITO CULEX PIPIENS L. AND THE MICROCRUSTACEAN DAPHNIA MAGNA STRAUS, Alexandria Univ. (Egypt). Faculty of Agriculture. I. A. Rawash, I. A. Gaaboub, F. M. El-Gayar, and A. Y. Fl-Shazii.

A. Y. El-Shazli. Toxicology, Vol 4, No 2, p 133-144, May 1975. 8 fig, 2 tab, 7 ref.

Descriptors: *Pesticides, *Insecticides, *DDT, Daphnia, *Mosquitos, *Growth stages, *Bioassay, *Toxicity, *Mortality, Methodology, Laboratory tests, Water pollution sources, Mature growth stage, Water pollution effects.

Sevin, Malathion, Identifiers: Kelthane, Standard log concentration-probit, LC-P, LC-50, *Daphnia magna, *Culex pipiens, Bioaccumulation, Fourth instar.

The fourth instar larvae of the mosquito Culex pipiens and adults of microcrustacean Daphnia magna were used as bioassay test organisms for the preparation of the standard log concentrationprobit (lc-p) regression lines for five pesticides-nuvacron, malathion, sevin, DDT, and kelthane. The LC50's indicated that Daphnia magna was far more sensitive than C. pipiens to all five pesti-cides. (Katz) W75-11082

ACCUMULATION OF CADMIUM. COPPER, MANGANESE AND ZINC BY FUCUS VESICULOSUS IN THE BRISTOL CHANNEL, Institute for Marine Environmental Research, Plymouth (England).
A. W. Morris, and A. J. Bale.
Estuarine and Coastal Marine Science, Vol 3, No

2, p 153-164, April 1975. 7 fig, 3 tab, 13 ref.

Descriptors: *Phaeophyta, *Metals, *Copper, Pescriptors: "Fnacopnyta, Metais, "Copper, "Zinc, "Cadmium, "Manganese, "Primary produc-tivity, Plant physiology, Sampling, Laboratory tests, Path of pollutants, Environmental effects, Absorption, Water pollution effects. Identifiers: *Fucus vesiculosus, Bioaccumulation, Tissue analysis, Bristol Channel(UK).

Comparison of the cadmium, copper and zinc contents of brown algae, Fucus vesiculosus at various sites in the Bristol Channel, with a detailed in-vestigation of dissolved trace metal concentrations to which they are subjected, demonstrated a passive nature of accumulation. Consistent concentration factors had been obtained over a range of mean ambient dissolved concentrations of these metals. In contrast, manganese accumulation appeared to be partially regulated. (Katz) W75-11083

ABSORPTION AND ELIMINATION OF PHOTODIELDRIN BY DAPHNIA AND GOLD-

Illinois Univ., Chicago. Dept. of Biological

H. M. Khan, S. Neudorf, and M. A. Q. Khan. Bulletin of Environmental Contamination and Toxicology, Vol 13, No 5, p 582-587, May 1975. 3 fig. 1 tab, 14 ref.

*Daphnia, Freshwater Descriptors: *Insecticides, Algae, *Dieldrin, *Organic pesticides, *Absorption, Plankton, Analytical techniques, Photometry, Food chains, Path of pollutants, Laboratory tests.

Identifiers: Ankistrodesmus spiralis, *Goldfish, Carassius auratus, Elimination, *Photodieldrin, Decontamination, Bioaccumulation.

The alga, Ankistrodesmus spiralis, became saturated with photodieldrin in 8 hours. Daphnia eliminated 50% of the absorbed photodieldrin in 4 days which increased up to 70% in 7 days. Continuous exposure of daphnids to photodieldrin resulted in increased absorption and accumulation of the insecticide. Transfer of contaminated gold-fish, Carassius auratus, to clean water resulted in initial elimination in 24 hours whose rate was subsequently reduced. (Katz) W75-11085

UPTAKE OF CADMIUM, ZINC, COPPER, LEAD AND CHROMIUM IN THE PACIFIC

Group 5B-Sources Of Pollution

OYSTER, CRASSOSTREA GIGAS, GROWN IN THE TAMAR RIVER, TASMANIA,

Tasmanian Dept. of the Environment, Hobart (Australia). G. M. Ayling

Water Research, Vol 8, No 10, p 729-738, October 1974. 4 fig, 7 map, 1 tab, 13 ref.

Descriptors: *Oysters, Descriptors: *Oysters, *Metals, *Cadmium, *Zinc, *Copper, *Lead, *Chromium, *Mud, *Bioassay, Food chains, Animal physiology, Water pollution, Laboratory tests, Path of pollu-Shellfish farming.

Identifiers: *Pacific oyster, *Crassostrea gigas, *Bioaccumulation, *Tissue analysis, Tamar River(Tasmania)

Pacific oysters (Crassostrea gigas) and mud samples from the Tamar River were analyzed for copper, cadmium, zinc, lead and chromium. Concentrations of cadmium, zinc and copper found in oysters were 10-40 times the concentrations in inhabited muds. Copper and chromium appeared to be absorbed up to a weight limited by oyster size and was independent of metal concentration in the mud. Lead was not absorbed through any physiological demand, but was randomly incor-porated at sites containing high concentrations in the mud. Zinc and cadmium were accumulated dependent on their concentrations in the mud. The concentrations of zinc and cadmium in muds may be used to indicate whether a site is grossly unsuited for the culture of oysters. (Katz) W75-11086

STUDIES ON THE INORGANIC COMPONENTS OF MARINE ANIMALS-III, ON THE CON-TENTS OF CADMIUM, ZINC, COPPER, LEAD AND IRON IN MUSCLE AND VISCERA MARINE ANIMALS CAPTURED IN THE WEST SEA AREA OF KYUSHU, (IN JAPANESE),

Nagasaki Univ. (Japan). For primary bibliographic entry see Field 5C. W75-11087

THE USE OF SNAKES AS A POLLUTION IN-

DICATOR SPECIES, Mesa Coll., Grand Junction, Colo. Dept. of Biological Sciences. B. Bauerle.

Copeia, No 2, p 366-368, 1975. 1 tab, 2 ref.

Descriptors: *Snakes, *Chlorinated hydrocarbon pesticides, *Lead, *Path of pollutants, Animal physiology, DDT, DDE, Dieldrin, Metals, Laboratests, Environmental effects, Pollutant identification, *Bioindicators.

Identifiers: *Gopher snakes, Pituophis catenifer, *Prairie rattlesnakes, Crotalus viridis, Bioaccumu-lation, Tissue analysis, Beta-benzene hexlation. achloride, Heptachlor epoxide.

Male gopher snakes, Pituophis catenifer, and prairie rattlesnakes, Crotalus viridis, were analyzed for 36 herbicides, pesticides, organophosphates, and lead in an ecosystem where these substances have seldom, if ever, been ap-plied. The snakes sampled had low levels of chlorinated hydrocarbons in their adipose tissue and low levels of lead in their livers. The most common chlorinated hydrocarbons found included DDE, DDT, dieldrin, beta-benzene hexachloride and heptachlor epoxide. (Katz) W75-11089

A MATHEMATICAL MODEL FOR OPTIMAL WASTE LOAD ALLOCATIONS, Oklahoma Univ., Norman, For primary bibliographic entry see Field 5G.

W75-11102

THE WATER QUALITY AND BOTTOM SEDI-MENT CHARACTERISTICS OF NEW JERSEY LAGOON DEVELOPMENTS, Rutgers - the State Univ., New Brunswick, N.J. E. H. Thurlow.

Available from University Microfilms, Inc., Ann Arbor, Mich, 48106. Order No 75-8450. PhD Thesis, 1974, 360 p.

*Waste Descriptors: *Waste disposal, *Lagoons, 'Sewage, *Water quality control, *New Jersey, Descriptors: Heavy metals, Sedimentation, Pollutant identifica-tion, Water pollution sources. Identifiers: Bottom sediments

A three year study of four lagoon developments A three year study of tour lagoon developments near Ocean County, New Jersey, was conducted to determine the nature of the water and bottom sediments, and the effects of types of waste disposal systems. It was found that each lagoon development had its own characteristic channel arrangement, amount and type of fresh water input, and inland penetration. Depth was a major factor influencing water quality; depths within and between lagoon systems were variable. Because lagoon areas are usually deeper than the adjacent bay, there was a hindering of water exchange and stagnant conditions are created in the bottom waters. As the shallowest area of the lagoon is usually at the mouth, the deeper remote points tended to be slightly more polluted due to depth, fresh water input, or poor water circulation. NH4(N), NO3(N), NO2(N), PO4, Cl, SO4, and some heavy metals, as well as anaerobic conditions were found accumulated in very deep lagoon areas. Lagoon sediments tended to be high in organic matter, total nitrogen content, CEC, and exchangeable cations, and to be black musks with H2S odors. An increase in population had an adverse effect on both the water quality and bottom sediments through increased addition of pollutants and organic materials from sewage, homes, and boats. Water quality in unsewered lagoons was better than quality of water in sewered lagoons, but bottom sediments of each were similar. (Prague-FIRL)

ENDEMIC NEPHROPHATHY AND ITS RELA-TION TO THE CONTAMINATION OF WELL WATER BY PHENOLIC COMPOUNDS IN BARSA-ARAD (NEFROPATIA ENDEMICA SI RELATIA CU IMPURIFICAREA PRIN COM-POUSI FENOLICI IN APELE FINTINILOR DIN COMUNA BARSA-ARAD), N. Mustata, and S. Matei.

Clujul Medical, Vol 47, No 3, p 543-547, 1974. 2

Descriptors: *Public health, *Water supply, *Phenols, *Potable water, Wells, Human pathology, Mortality, Water pollution sources, Water pollution effects, Water wells. nephropathy,

*Endemic Identifiers: *Romania(Barsa-Arad).

Phenolic compounds were found in the water of wells in the commune of Barsa-Arad. Eleven persons died after drinking this water and 9 other persons were ill with endemic nephropathy. The con centrations of phenolics varied between 28 and 203 gamma/liter. The concentration levels were found to be distributed in three rows at the base of the ground level elevation existing in this locality of the bank of the Morilor channel. A similarity was determined to exist between the peculiarities of contamination with phenolic compounds in the Barsa-Arad region and of other zones of endemic nephropathy in the Secaseni (Caras-Severin District) and Strehaia (Mehedinti District) of Romania. (Orr-FIRL) W75-11105

LIMITATIONS OF USING A SIMULATION MODEL OF THE SOIL UNDER IRRIGATED CULTIVATION TO SIMULATE THE FUNCTIONING OF THE SOIL AS A PURIFYING SYSTEM (LIMITES D'UTILISATION D'UN MODELE DE COMPORTEMENT DU SOL SOUS CULTURE IRRIGUEE POUR SIMULER LE

FONCTIONNMENT DU SOL COMME SYSTEME EPURATEUR),

Institut National de la Recherche Agronomique, Versailles (France). Soils Lab. P. Graffin.

Annales Agronomiques, Vol 25, No 2/3, p 157-177, 1974. 4 fig, 14 ref.

Descriptors: *Model studies, *Simulation analysis, Irrigated land, Land use, Drainage, Soil water, Groundwater, Waste disposal, Waste water treatment. Water reuse Identifiers: *Land disposal.

The use of a simulation model of the soil under irrigated cultivation was aimed at forecasting the results of organic wastes purification by the soil and subsequent environmental effects.
Researchers in the United States considered such a model, combining the dependent factors of: water circulation in non-saturating conditions; ionic exchanges between the solid phase and liquid phase; displacement of soluble elements; transformation of organic matter in aerobic conditions; and water and nitrate absorption by plants. This DUTT model is not applicable for general waste spreading on land or for conditions involving evolution in an anaerobic medium. The model is, however, useful for land application of wastes under classical agricultural practices involving moderate quantities of organic matter. Composition of the drainage water as well as any changes in soil composition, are central variables in programming this model. (Prague-FIRL)
W75-11125

W

sei

co op dis

COI

A DC

wa

leg: me

ma

req ble-the W7

SOT Mid

A. I

Alet Wat

*Pol

Sedi

cides

Cons

Iden

fluen

area

pollu

disch:

tivity.

Agric

the r

tion (

livesto Source

DRUG RESISTANT COLIFORMS CALL FOR RE-EVALUATION OF WATER QUALITY STANDARDS

National Inst. for Water Research, Pretoria (South

W. O. K. Grabow, O. W. Prozesky, and L. S. Smith.

Water Pollution Control, Vol 74, No 2, p 217-224, 1975. 1 tab, 120 ref.

*Coliforms, *Sewage Descriptors: Pathogenic bacteria, *Water quality standards, Sewage treatment, Enteric bacteria, Public health, E. coli, Water pollution sources. Identifiers: *Drug resistant bacteria, *R factor.

Evidence is presented to support the idea that water polluted with coliform and other bacteria generally considered as non-pathogenic contributes to the incidence of drug resistance among bacteria involved in disease. Resistance to drugs is imparted by chromosomal resistance and by resistance (R) factors. R factors are ex-trachromosomal nucleic acid elements (plasmids) which replicate autonomously. R factors are transmissible among Gram negative bacteria such as enterobacteria including E. coli, Salmonella typhi and Shigella dysenteriae. Ingestion of bacteria carrying R factors (R+ bacteria) can result in the transfer of these factors to the normal intestinal flora. These organisms then act as a reservoir of resistance which they may transfer to sensitive bacteria involved in disease. The two factors which are involved in the spread of R+ bacteria are drug resistance which selects for resistance plasmids and the transmission of these organisms from excretors to the rest of the population through sewage. Two percent of the coliforms in sewage and in sewage polluted water can be expected to carry R factors (maximum 26% in a hospital effluent). Current water quality standards regard coliforms as purely indicators of fecal pol-lution. However, since plasmid infected coliforms have been shown to be joined with bacteria increasingly involved in disease, they can no longer be regarded as harmless. This necessitates a reevaluation of quantitative and qualitative water criteria as well as increasing the list of reasons for more advanced sewage treatment. (Orr-FIRL) W75-11130

Sources Of Pollution-Group 5B

SOUTH AFRICAN EUTROPHICATION PROBLEMS: A PERSPECTIVE,
National Inst. for Water Research, Pretoria (South

For primary bibliographic entry see Field 5C. W75-11131

A NEW LOOK AT POLLUTION PREVENTION

ON LOWLAND RIVERS, Thames Water Authority, London (England). For primary bibliographic entry see Field 5G. W75-11132

DESIGN OF THE OPTIMAL OUTFALL SYSTEM FOR A STREAM RECEIVING THER-MAL AND ORGANIC WASTE DISCHARGES,

MAL AND ORGANIC WASTE DISCHARGES, Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization. S. H. Lin, L. T. Fan, and C. L. Hwang. Water Research, Vol 9, No 7, p 623-630, July 1975. 12 fig, 1 tab, 17 ref. OWRT B-037-KAN(2).

Descriptors: *Outlets, *Sewers, *Cooling water, Outfall sewers, Computer models, Model studies, Outlan sewers, Computer models, Model studies, Water temperature, Biochemical oxygen demand, Dissolved oxygen, Drainage systems, Streams, Water quality, Water cooling, Discharge(Water), Heated water, Aeration, Water pollution sources, Water pollution, Waste assimilative capacity, Thermal pollution, Organic wastes, Temperature, Design, Design criteria.

A system synthesis technique was employed for selecting the 'best' outfall configuration for a stream that receives multiple thermal and organic waste discharges. The optimal locations for the cooling water and organic waste discharges, the optimal allocations of the wastes to these discharge points, and the optimal artificial aeration control policies were simultaneously determined. A dual water quality constraint on the minimum DO concentration and the maximum BOD concentration was imposed in order to ensure that the water quality be maintained above a minimum legal requirement. The complex pattern search method along with the modified algorithm of the maximum principle was used to generate the required information. A specific example of dou-ble-outfall system was solved to illustrate the theoretical development. (Sims-ISWS)

a,

ria on-ong

re-

exds)

ns

en-phi

the

inal

r of

tive

eria

ance

ation

ns in e ex in a

polorms

onger

a re-water ns for

WATER POLLUTION FROM NONPOINT SOURCES,

Midwest Research Inst., Kansas City, Mo. A.D. McElroy, S. Y. Chiu, J. W. Nebgen, A Aleti, and A. E. Vandegrift. Water Research, Vol 9, No 7, p 675-681, July 1975. 3 tab. 18 ref.

Descriptors: *Water pollution sources, *Pollutants, *Water pollution, *United States, Sediments, Mine wastes, Acid mine water, Salinity, Heavy metals, Nutrients, Fertilizers, Pesti-cides, Agriculture, Mining, Forest management, Construction, Organic wastes, Water quality. Identifiers: *Non-point pollutant sources

Nonpoint pollutant sources exert a significant influence on water quality in the United States. Based on land use data, more than 97% of the land area in the U.S. is a potential source of nonpoint area in the U.S. is a potential source of nonpoint mportant pollutants are sediment, nutrients, pesticides, organic wastes, thermal discharges, acid mine drainage, salinity, radioactivity, microbial pollutants, and heavy metals. Agriculture, especially cropland, is responsible for the release of large quantities of sediment, nutrients, and pesticides. Because of the production of large quantities of sediment, proposed to the production of large quantities of segments was the form tion of large quantities of organic wastes from livestock operations, these wastes can be potential source of water quality degradation, if not handled properly. Silviculture is a source of sediment. Other pollutants originating from silvicultural operations include very limited quantities of nutrients, pesticides, and thermal discharges. Surface mining is a major source of erosion sediment. Acid mine drainage, salinity, and heavy metals are other important pollutants from mining. Sediment is a major pollutant from construction industry. (Sims-ISWS)

DISSOLVED GAS SUPERSATURATION AND DILUTION IN THERMAL PLUMES FROM STEAM ELECTRIC GENERATING STATIONS, Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
G. F. Lee, and P. H. Martin.

Water Research, Vol 9, No 7, p 643-648, July 1975.

Descriptors: *Supersaturation, *Gases, *Cooling water, *Powerplants, Nitrogen, Oxygen, Waste dilution, Discharge(Water), Thermal powerplants, Nuclear powerplants, Electric powerplants, Fish, On-site investigations, Water pollution, Velocity, Heated water, *Thermal pollution.

The use of natural waters for waste heat dissipation for steam electric generating stations using once-through cooling creates potential problem of dissolved gas supersaturation in the thermal discharge plume for fish that can reside in the plume. Computations were presented which show the amount of dissolved gas supersaturation that would be expected in thermal discharge plumes employing offshore high velocity discharge and onshore low velocity discharge. It was predicted that dissolved gas supersaturation problems would be rare for steam electric generating stations utiliz-ing high velocity offshore discharge for cooling water/heat dissipation because of the rapid dilution that occurs in the discharge plume. However, problems of this type would be expected for low velocity discharges. It was also shown that the rate of dilution from high velocity discharges would tend to minimize the environmental impact of chemicals (such as chlorine) used for condenser fouling control. (Sims-ISWS) W75-11159

BEHAVIOR OF MN, FE, CU, ZN, CD AND PB DISCHARGED FROM A WASTEWATER TREATMENT PLANT INTO AN ESTUARINE ENVIRONMENT, Maryland Univ., College Park. Dept. of Chemis-

G. R. Helz, R. J. Huggett, and J. M. Hill. Water Research, Vol 9, No 7, p 631-636, July 1975. 6 fig, 1 tab, 23 ref. NSF Grant GI-38973.

Descriptors: *Trace elements, *Metals, *Water pollution, *Estuaries, *Maryland, Manganese, Iron, Copper, Zinc, Cadmium, Lead, Heavy metals, Pollutants, Sampling, Chemical analysis, Water pollution sources, Wastes, Sewage effluents, Sediments, Path of pollutants. Identifiers: *Back River(Md)

To obtain information on the fate of trace metals discharged to an estuarine environment, analyses were made on water and sediment samples from Back River, Maryland, and on effluent from the large wastewater treatment plant that discharges there. Within 2-3 km of the outfall, the concentration (in micrograms/liter) of all metals decreases as follows: Mn, greater than 120-90; Fe, greater than 570-300; Cu, 53-7; Zn, 280-9; Cd, 3.5-0.5 and Pb, 31- less than 4. Except possibly for Mn and Fe, these decreases are much greater than can be ascribed to simple dilution, so physical, chemical or biological processes must be removing metals to the sediments. Correspondingly, sediment concentrations of Cu, Zn, Cd, and Pb are approximately one order of magnitude higher than normally found in uncontaminated areas. After the initial decrease, concentrations of Mn and Cd in the water begin to rise again, suggesting remobiliza-tion from the sediments. Comparison of the esti-mated annual discharge of 8 trace metals to the Chesapeake Bay from wastewater treatment plants and from rivers suggests that the wasteplants and from rivers suggests that the waster-water input may be within one order of magnitude of the fluvial input for Cr, Cu, Zn, Cd, and Pb. Of the metals studied, Cd presents the greatest poten-tial for serious pollution because its input from wastewater probably exceeds fluvial input, it appears to be readily remobilized from sediments, and it is known to be toxic to many organisms. (Sims-ISWS) W75-11160

EVIDENCE OF ATMOSPHERIC TRANSPORT OF OZONE INTO URBAN AREAS,

New York State Dept. of Environmental Conservation, Albany. Div. of Air Resources. For primary bibliographic entry see Field 5A. W75-11169

MUTAGENS AND POTENTIAL MUTAGENS IN THE BIOSPHERE: 1. DDT AND ITS METABOLITES, POLYCHLORINATED BIPHENYLS, CHLORODIOXINS, POLY-BIPHENYLS, AROMATIC HYDROCARBONS, HALOETHERS.

National Center for Toxicological Research, Jefferson, Ark. L. Fishbein.

Sci Total Environ, Vol 2, No 4, p 305-340, 1974.

Descriptors: *DDT, *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, Distribution, Path of pollutants, Reviews, Toxicity. Identifiers: Aromatic hydrocarbons, Biosphere, Chlorodioxins, Ethers, Metabolites, *Mutagens,

For proper assessment of actual risks, the interactions between different modes of administration of a toxicant must be understood and the probable impingement of the environmental substances upon the various portals of entry must be known. To best understand this last requirement we must know how the toxicants in question are distributed in and are transported through the environment to finally impact on man. In this review, a small number of mutagens and potential mutagens (e.g., number of mutagens and potential mutagens (e.g., DDT and its metabolites, polychlorinated biphenyls, chlorinated dioxins, polycyclic aromatic hydrocarbons and haloethers) are evaluated in terms of their occurrence, use patterns, distributions and impact in the environment. In many cases the information is fragmentary; e.g., patterns of region and local variation of the toxicants have been only superficially investinated and the have been only superficially investigated and the detailed pathways of residues within the trophic networks are poorly understood. The physiological and ecological effects of the toxicants at sublethal levels are also to a large extent unknown. More information is needed as to the production (nature of reactants, amounts, reactivity, disposal, etc.), import and export data for specific potential environmental toxicants, the nature and routes of their global transport, and the concentration, longevity, biochemical and toxicological activity of their residues (including specific chemical nature) that occur in their various biosphere compartments including air, water, soil, and biota. (See also W75-11171)--Copyright 1974, Biological Abstracts. Inc.

MUTAGENS AND POTENTIAL MUTAGENS IN THE BIOSPHERE: II. METALS--MERCURY, LEAD, CADMIUM AND TIN, National Center for Toxicological Research, Jef-

Sci Total Environ, Vol 2, No 4, p 341-371, 1974.

Descriptors: Metals, Heavy metals, *Mercury, *Lead, Cadmium, Reviews, Toxicity, Distribution, Path of pollutants, Environmental effects. Identifiers: *Biosphere, *Mutagens, Tin, Tox-

Group 5B-Sources Of Pollution

Comparative data (wherever available) are presented on the amounts and residues in the environment of a small number of mutagenic and potentially mutagenic metals focussing on Hg, Pb, Cd and Sn (and their principal derivatives). Primary consideration is given to aspects of their production and/or occurrence, reactivity, and/or occurrence, reactivity, concentration, transfer, longevity, biochemical and toxicological nature of their residues in the various biosphere compartments. (See also W75-11170)--Copyright 1974, Biological Abstracts, Inc. W75-11171

DISSIPATION OF RESIDUES OF PHENOXY HERBICIDES APPLIED FOR WATER MILFOIL CONTROL IN LARGE RESERVOIRS,

Tennessee Valley Authority, Muscle Shoals, Ala. W. W. Barnes.

In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 37-41, August 1974.

Descriptors: *Monitoring, *Aquatic weed control, *2-4-D, *Bioassay, *Pesticide residues, *2-4-D, *Bioassay, *Pesticide residues, *Tennessee Valley Authority, Tennessee River, Benthos, Clams, Mussels, Insects, Rates of application, Bottom sediments, Fish, Potable water, Tennessee, Alabama, Reservoirs. Identifiers: Water milfoil.

Eurasian water milfoil in seven TVA reservoirs from Melton Hill in east Tennessee to Wilson Dam north Alabama was treated with 2,4-D butex-yethanol ester. 2,4-D did not depress benthic insects (especially Hexagenia nymphs), clams, and mussels, but milfoil eradication eliminated substrates for epiphytic insects (immature midges, mayflies, and dragonflies). Forty percent of sam-ples of mud, fish, milfoil, mussels, and Asiatic clams contained less than 0.10 ppm of 2,4-D residues; fish showed little uptake, mussels some, and some mud samples contained significant concentrations for 10 months. Net tests showed that 40-100 pounds 2,4-D per acre caused some move-ment of fish from treated areas, but there were no distressed or dead native fish. Laboratory tests indicated that complete control of milfoil can be obtained with exposures of 3 ppm 2,4-D for 5 hours, 1 ppm for 48 hours, or 0.1 ppm for about 30 days. A sensitive bioassay technique for measuring 2,4-D residues in reservoirs was developed. Following treatment with granular 2,4-D, 2,4-D residues were initially high at the water surface, then decreased. The rate of decrease depended on the degree of dilution by water movement. Water treatment plants along the Tennessee River system were monitored for 2,4-D residues using carbon filters. (See also W75-08289) (Buchanan-Davidson--W75-11198

DISSIPATION OF RESIDUES OF PHENOXY HERBICIDES APPLIED TO THE WATERSHED, Oregon State Univ., Corvallis. School of Forestry Norris

L. E. NOTTS.

In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p E5-E12, August 1974. 5 tab, 6 ref.

Descriptors: *Pesticide residues. *Weed control. *Watersheds(Basins), *Vegetation, *Oregon, Herbicides, 2-4-D, 2-4-5-T, Path of pollutants, Leaching, Persistence, Surface runoff, Streams,

Identifiers: Cascade Creek Watershed(Ore), Ed-dyville Watershed(Ore), Malheur National Forest(Ore), Terrestrial vegetation.

Spray projects in Oregon illustrate application methods to minimize residues of phenoxy herbi-cides in streams and runoff. When the Cascade Creek Watershed was sprayed with 2,4,5-T and the Eddyville Watershed and Malheur National Forest were treated with 2,4-D, there was usually a short period of contamination. The magnitude of contamination was not a function of the herbicide or geographical location, but was closely related to the manner in which the treatment area was laid out with respect to live streams. When spray boundaries were close to, but did not include, live streams, downstream herbicide concentrations were low and persisted for only a short time. When there was standing water and a high water table high concentrations of herbicides were found shortly after application and persisted for long periods of time. Leaching and surface runoff can move chemicals from deposit areas to streams. Surface flow can carry large amounts of chemicals long distances in a short time. This rarely occurs in western forests since the infiltration capacity of the forest floor and soil is much larger than the precipitation. Most pesticide residues enter the soil where absorption prevents their movement. Leaching is slow and moves only small amounts of herbicide short distances. (See also W75-08289) (Buchanan-Davidson--Wisconsin) W75-11213

DISSIPATION OF PHENOXY HERBICIDES AP-PLIED TO RIPARIAN VEGETATION.

Pennsylvania State Univ., University Park. School of Forestry.

W. E. Sopper.

In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p E13-E16, August 1974.

Descriptors: *Herbicides, *Pesticide residues, *Riparian plants, Banks, Brush control, Spraying, Streams, Watershed management, Watersheds(Basins), *New Jersey, Streams. Watersheds(Basins), *Pennsylvania, 2-4-D, 2-4-5-T, Vegetation, Pota-ble water, Rates of application.

To determine the extent of streamflow contamination following the spraying of riparian vegetation with phenoxy herbicides, the banks of small head-water streams of the Newark, New Jersey watershed and Stone Valley Experimental Forest in Pennsylvania were sprayed with a 2,4,5-T ester or emulsifiable acid during a low streamflow period (flow less than 0.1 cfs (45 gpm)). During the three weeks after treatment, odor contamination was only observed in the treated reach of the stream immediately after spraying and after the first large storm. No contamination was found downstream. The ester formulation had completely killed 70-81% of the brush stems, and the emulsifiable acid had killed 58-78%. From 17-32% of the remaining stems were partially killed. A subsequent treatment in 3-5 years should eliminate the remaining stems. New streambank vegetation was primarily grasses and herbaceous species which should eventually predominate. Phenoxy herbicides can therefore be used to control riparian vegetation on municipal watersheds if properly ap-plied with normal precautions. (See also W75-08289) (Buchanan-Davidson--Wisconsin) W75-11214

CHELATION STUDY OF COPPER (II): FULVIC ACID SYSTEM, Canada Centre for Inland Waters, Burlington

(Ontario). V. Cheam

Canadian Journal of Soil Science, Vol 53, No 4, p 377-382, 1973. 2 fig, 1 tab, 29 ref.

Descriptors: Analytical techniques, *Humic acids, *Chelation, *Fulvic acids, *Copper, *Volumetric analysis, Electrodes, Chemical reactions, Organic acids, Ions, Chemical analysis, *Pollutant identification, *Water pollution.

Complexing of humic compounds was studied using an ion-selective electrode. Chelation between copper ion and fulvic acid using a solid-Chelation state electrode reversible to this ion occurred at the salicyclic acid-like bidentate sites of fulvic acid, which consists of phenolic hydroxyl groups ortho to ionized carboxyl groups. The mass action quotient (equilibrium quotient) varied with pH and mole fractions less than 0.3. The pH 3 curve of copper-fulvic acid chelation leveled off at mole fractions of 0.3-0.7, indicating that the equilibrium constant does not depend on reactant concentrations; this is consistent with the assumption that the chelate is a 1:1 type complex. In this composition range the best mass action quotient value is 2.2. Assuming that the pH 4 and 5 curves behave similarly in this mole fraction range, the mass action quotients would be about 0.6 and 0.25, respectively. Under these conditions fulvic acid appeared to be a stronger chelating agent than salcyclic acid. Higher complexes may exist when the mole fraction is smaller than 0.3. Under conditions found in natural lake waters, copper is probably strongly bonded to fulvic acid. Other trace ele ments may act in a similar way toward fulvic acid and humic substances. (Buchanan-Davidson--Wisconsin)

be ve

G/ QI Tu

A tio 820

Co

app

De De

Sol

Stu

con

den

the

teris

posi

the

cher

pass

give

spec

and

lysin

Leac

wast

lag p

area

ft din

millil

The I

initial

more

with a

the so

pH 6.

DRIL

WAST

Fisher

(Manit

For pr W75-1

FERT

LAKE

Austra P. W. C

SEDIMENT PROCESSES IN GREAT LAKES, Canada Centre for Inland Waters, Burlington (Ontario).

For primary bibliographic entry see Field 2J. W75-11237

THE UTILIZATION OF SUN-GLINT IN A STUDY OF LAKE DYNAMICS, Canada Centre for Inland Waters, Burlington(Ontario). For primary bibliographic entry see Field 5A. W75-11239

PRELIMINARY INFORMATION ON THE NA-TURE OF ORGANIC MATTER IN THE SUR-FACE SEDIMENTS OF LAKES HURON, ERIE, AND ONTARIO.

Canada Centre for Inland Waters, Burlington (Ontario). For primary bibliographic entry see Field 2J.

W75-11240 CHANGES IN VEGETATION AND SURFACE SOIL PROPERTIES FOLLOWING IRRIGATION

OF WOODLANDS WITH MUNICIPAL WASTE-WATER, Michigan State Univ., East Lansing. Dept. of

Forestry D. P. White, G. Schneider, E. A. Erickson, and D.

Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 798, \$4.75 in paper copy, \$2.25 in microfiche. Completion Report, Institute of Water Research, Michigan State University, East Lausing, August 1975. 76 p, 11 fig. 17 tab, 17 ref. OWRT A-055-MICH(1), 14-31-0001-3522.

Descriptors: *Water reuse, *Waste water treatment, Soil properties, Irrigation, Municipal wastes, Sewage effluents, Soil surfaces, Soil chemistry, *Biodegradation, Nutrients, Water chemistry, *Biodegradation. Nutrients, Water quality, *Humus, *Decomposing organic matter, *Michigan, Forests, Vegetation, Water pollution

Identifiers: Soil water quality, Humus decomposi-tion, Vegetation growth, Red pine forest, Maple-beech hardwood forest.

The impact of municipal wastewater irrigation on soil water quality, Vegetation growth and nutrient status, soil chemistry, and humus decomposition in a 20-year old red pine plantation and maplebeech hardwood forest in southern Michigan was studied. The pine plantation was spray irrigated

Effects Of Pollution-Group 5C

with sewage stabilization pond effluent during the summer and early fall of 1972-4. The hardwood forest site received 25, 50 and 75 mm/week of secondary sewage effluent and 50 mm/week of well water through a trickle irrigation system during 1972-3. Observations and measurements were made on water quality; renovation of percolating waters as determined by analysis of samples from suction lysimeters; growth and nutrient status of vegetation; changes in soil chemistry; changes in soil humus and fungi. Recommendations included restriction of irrigation infiltration rates to 3 mm/hour and weekly loadings to 50 mm. Maximization of vegetative growth should be subor-dinated to maintaining the ecosystem in a viable condition. Toxicity of effluent pollutants such as boron could be a serious threat to certain types of vegetation and may limit the use of pine plantations as potential wastewater disposal sites. W75-11243

SOLID WASTES, ANIMAL REFUSE, AND OR-GANIC RESIDUES DISPOSAL, AND THE OUALITY OF GROUND WATER,

Tuskegee Inst., Ala. School of Applied Sciences. W. E. Nelson.

1

oil

lei

er

on

le

ent

ale.

Available from the National Technical Informa tion Service, Springfield, Va. 22161, as PB-244 826, \$4.25 in paper copy, \$2.25 in microfiche. Completion Report, (1975), 66 p, 14 fig, 19 tab, 8 append. OWRT C-3089(No 3732)(1).

Descriptors: Landfills, *Leachate, *Groundwater, Design criteria, Soils, Metals, Trace elements, Granes, Soil types, Water quality, Farm wastes, Solid wastes, Waste disposal, Feed lots, *Path of pollutants, Water pollution sources. Identifiers: Leachate production, Cover material.

Studies on a field sanitary landfill on a laboratory sanitary landfills, and on an animal feedlot were conducted to correlate the design criteria, field density, temperature and subsidence patterns of the buried wastes, and the vegetative covers with the chemical and ground water pollutional characteristics of the leachates generated by the decom-posing wastes. These data were interpreted in relation to the field densities of the compacted refuse, the vegetative covers, time, and the eventual chemical character of leachates after having passed through a prescribed distance of soil in a given time. The results indicate that there are no specific relationships between precipitation, time, and the volume of leachate drained from the lysimeters compacted to two levels of compaction. Leachates were generated only after the buried wastes were saturated which represent a six week lag period during which 5.56 ft of rain fell on the area (or 475.7 liters of rainfall per the 6 ft x 6 ft x 6 ft dimension of each lysimeter, and producing 3.92 milliliters of leachate in the 6th week after burial). The leachates (pH 6.98 - 11.35) had high concentrations of the chemical constituents initially (at the initial soil - solid waste interface) but decreased as more leachate was generated, or as the leachate with any given total concentration passed through the soil. This, with the lowering of the pH (down to pH 6.0) indicates that the soil removes chemical pollutants from the permeating leachates. W75-11244

ACUTE TOXICITY OF PETROCHEMICAL DRILLING FLUIDS COMPONENTS AND

WASTES TO FISH,
Fisheries and Marine Service, W.
(Manitoba). Resource Management Branch. Winnipeg For primary bibliographic entry see Field 5C. W75-11265

FERTILIZER PHOSPHATE IN STREAMS AND LAKES,

Canberra Coll. of Advanced Education (Australia). P. W. Cullen.

In: Fertilizers and the Environment. Proceedings of a Symposium, Wesley College, University of Sydney, May 13-15, 1974. Australian Institute of Agricultural Science (New South Wales Branch), Sydney, p 103-109, 1974. 1 tab, 26 ref.

Descriptors: *Fertilizers, *Phosphorus compounds, *Water pollution effects, *Path of pollutants, Reviews, Leaching, Phosphates, Agriculture, Water pollution sources, Eutrophication.

Studies of the amount and route of fertilizer phosphorus movement from the point of application into natural waters are reviewed. Generally such studies have shown that the leakage of phosphate from treated areas is low in proportion to the amount applied. However, what is considered low as a loss from the agricultural system may be considered substantial as an input to aquatic ecosystems. (CSIRO) W75-11310

NATURAL AND FERTILIZER NITROGEN IN STREAMS AND LAKES,

Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Use Research.

P. Jakobsen.

In: Fertilizers and the Environment. Proceedings of a Symposium Wesley College, University of Sydney, May 13 - 15, 1974. Australian Institute of Agricultural Science, (New South Wales Branch), Sydney, p 53-59, 1974. 47 ref.

Descriptors: *Nitrogen compounds, *Eutrophication, *Fertilizers, *Water pollution effects, *Path of pollutants, Nitrogen cycle, Lakes, Streams, Ecosystems, Reviews,

The major conditions and reactions relevant to the effects of nitrogen in eutrophication are reviewed. These include the major access routes of nitrogen to streams and lakes, accession of ions caused by disruption of ecosystems, characteristics of streams and lakes affecting the occurrence and rate of eutrophication, and the effects of nitrogen loading on aquatic ecosystems as influenced directly by biological and chemical factors and indirectly by environmental constraints. (CSIRO) W75-11311

BIODEGRADATION OF COMPONENTS OF PULP WASTE EFFLUENTS BY BACTERIA. (1). DEGRADATION OF KRAFT LIGNIN (IN JAPANESE).

Nagoya Univ. (Japan). Faculty of Agriculture. H. Kawakami, M. Sugiura, and T. Kanda. Japan Tappi, Vol 29, No 6, p 309-315, June, 1975. 5 fig, 13 ref, 8 tab, English summary.

Descriptors: *Lignins, *Biodegradation, wastes, Water pollution sources, Industrial wastes, Wastes, Pseudomonas, Aerobic bacteria, Water pollution, Incubation, Decomposing organic matter, Organic compounds, Oxidation, Foreign research, Pine trees, Softwood, Hardwood, Molecular structure.

Identifiers: Beech trees(Fagus), Pseudomonas ovalis, Japan.

The degradation of pine and beech kraft lignin in natural water systems by Pseudomonas ovalis was investigated. After 60-day incubation, pine lignin was much more decomposed than beech lignin. The high-molecular-weight portion of the softwood lignin was appreciably affected and showed a marked increase in carbonyl groups, as well as an extreme decrease in vanillin-producing groups. These groups and syringyl groups decreased only slightly in the hardwood lignin while biphenyl, condensed 5-guaiacyl, and syringyl structures increased upon bacterial decay. Although MeO groups decreased with progressive biodegradation, phenolic and catecholic OH groups decreased also in the residual lignin. On permanganate oxidation, the residual lignin showed in-creases in p-hydroxyphenyl and 4-methoxyisophthalic acid groups. It appears that Ps. ovalis causes demethoxylation, rather than demethyla-tion of kraft lignins. (Brown-IPC) W75-11346

5C. Effects Of Pollution

EPIFAUNAL INVERTEBRATES AS INDICA-TORS OF WATER QUALITY IN SOUTHERN LAKE PONTCHARTAIN,

New Orleans Univ., La. Dept. of Biological Sciences

M. A. Poirrier, J. S. Rogers, M. A. Mulino, and E. S. Eisenberg.

Available from the National Technical Informa tion Service, Springfield, Va. 22161, as PB-244 533, \$4.25 in paper copy, \$2.25 in microfiche. Louisiana Water Resources Research Institute, Baton Rouge, Technical Report No 5, May 1975. 43 p. 6 fig. 34 tab. 28 ref. OWRT A-035-LA(1).

Descriptors: Physicochemical properties, Chemical analysis, Bioassay, *Bioindicators, *Invertebrates, *Pollutant identification, Water quality, Estuarine environment, Correlation analysis, Frequency analysis, *Louisiana, Nutrients, Phytoplankton, Primary productivity, Distribution, Eutrophication.

Identifiers: *Lake Pontchartrain(La), *Epifaunal invertebrates.

The distribution and relative abundance of estuarine epifaunal invertebrates can be used to detect water quality differences. Epifaunal invertebrate associations were affected by salinity and storm-water discharge. Differences among both biological and physico-chemical stations were related to discharge of more saline water by the In dustrial Canal and quality differences of outfall canal discharge. In 1973 the opening of the Bonnet Carre Spillway added alkaline nutrient-rich, fresh water from the Mississippi River and affected all water quality parameters. Gradual changes oc-curred as the river water was flushed from the lake. Increased phytoplankton growth resulted from the addition of nutrients. Epifaunal invertebrates were not greatly affected because 26 predominantly estuarine taxa were present weeks after the spillway was closed. Storm-water discharge by outfall canals adds plant nutrients, coliform bacteria and other undesirable sub stances to the lake. Salinity was lower, but alkalinity, pH and nutrient values were higher due to the spillway opening and heavy rainfall. There was a west-to-east gradient of changing water quality in near-shore stations. Stations near outfall canals in Jefferson Parish had higher nutrient values and lower dissolved oxygen concentration than did similar areas in Orleans Parish. Salinities were higher in Orleans Parish and highest near the Inner Harbor Navigation Canal. Near-shore areas should no be used for recreational activities such as swimming or water skiing because of high concentrations of fecal coliform bacteria.

SOME LIMNOLOGICAL CHARACTERISTICS OF ARIVACA LAKE IN SOUTHERN ARIZONA,

Arizona Univ., Tucson.
For primary bibliographic entry see Field 2H.
W75-10891

POLLUTION AND SEABIRDS DENMARK 1935-1968,

Game Biology Station, Ronde (Denmark). A. H. Joensen.

Dan Rev Game Biol. Vol 6, No 8, p 1-24, 1972,

Descriptors: *Oil pollution, *Birds, Swans, Ducks(Wild), Gulls, Water pollution effects.

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION Group 5C-Effects Of Pollution

Identifiers: Alca-torda. Anas-platyrhynchos. Aythya-fuligula, Clangula-hyemalis, *Denmark, Duck, Fulicaaatra, Melanitta-fusca, Melanitta-Somateria-molissima, Uria-aalge,

The number of cases of pollution involving birds increased during the period, but the increase is not so great as the increase in amount of oil transported through Danish waters. Cases of oil pollution occur throughout the year, but great numbers of birds die especially in the 2 coldest months, Jan. and Feb. Throughout the period, most Danish waters were regularly affected by cases of widespread bird mortality. Mortality due to oil mainly affected by spp., which in general are found in the sea far from shore: Somateria mollissima, Melanitta nigra, Melanitta fusca, Clangula hyemalis. Alca torda and Uria aalge. Swans were often reported oiled, but total numbers killed are comparatively small. Other species which occur in Denmark in large numbers confined mostly freshand brackish water and areas close to the coasts were seldom reported oiled. This is the case for Anas platyrhynchos and other dabbling ducks, Aythya fuligula, Fulica atra and gulls .-- Copyright 1974, Biological Abstracts, Inc.

CONCURRENT NITRIFICATION-DENITRIFI-CATION AT THE SEDIMENT-WATER INTER-FACE AS A MECHANISM FOR NITROGEN LOSSES FROM LAKES,

Wisconsin Univ., Madison. Dept. of Soil Science. D. R. Keeney, S. Schmidt, and C. Wilkinson Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 503, \$3.25 in paper copy, \$2.25 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report WIS WRC 75-07, August 1975. 21 p, 4 tab, 37 ref. OWRT A-057-WIS(1). 14-31-0001-4050.

Descriptors: *Nitrification. Ammonia *Denitrification, Interfaces, *Lake sediments, Water quality, Nitrogen, *Sediment-water inter-faces, Lakes, Nitrates, *Aeration, Oxidation-reduction potential, *Nutrient removal, Lakes. Identifiers: Artificial aeration, *Ammonium-

Conditions at the sediment-water interface can, in theory, have a major impact on the nitrogen balance of the lake system. Unless the bottom waters are completely anoxic, nitrification should proceed just above the sediment. If the nitrate thus formed diffuses into the anaerobic sediment, denitrification can occur. The feasibility of nitrification-denitrification at the sediment-water interface and the effect of cyclic artificial aeration on the rate of these aerations were investigated. The approach used was to aerate a model sedimentwater system, then cease aeration and allow the system to go anaerobic. This cycle was repeated several times over a 106-day period. Performance was monitored by determination of inorganic N in the water, Eh of the water, and N distribution in the sediment. Aeration of the systems consistently resulted in a decrease in ammonium-N and an increase in nitrate-N in the water and a corresponding rise in Eh to +300 to +380 mV. When the systems were not aerated, nitrate-N and Eh declined, and ammonium-N increased. The sediment remained anaerobic (-220 mV). Pore water ammonium-N and exchangeable ammonium-N in sediment cores taken after the experiment in-creased with sediment depth, indicating that ammonium-N was released from the sediment to the overlying water. Mass balance calculations indicated a loss of about one-third of the available N in the system. Thus, it is conceivable that nitrification-denitrification by hypolimnion aeration could remove a portion of the N loading of a lake. W75-10902 GEOCHEMICAL RECONAISSANCE OF SURFI-CIAL MATERIALS IN THE VICINITY OF SHAWANGUNK MOUNTAIN, NEW YORK For primary bibliographic entry see Field 5A.

WATERBORNE GASTROENTERITIS EPIDEMIC IN PICO RIVERS, CALIFORNIA Los Angeles County Health Services Dept., Calif. Immunization Project. For primary bibliographic entry see Field 5F. W75-11005

SEASONAL VARIATION IN COMPOSITION, PLANT BIOMASS, AND NET PRIMARY PRODUCTIVITY OF A TROPICAL GRASSLAND AT KURUKSHETRA, INDIA. Kurukshetra Univ. (India). Dept. of Botany For primary bibliographic entry see Field 2I. W75-11006

ROOT:SHOOT AND LEAF AREA RELATION-SHIPS OF MACROPHYTE COMMUNITIES IN CHAUTAUQUA LAKE, NEW YORK, State Univ. Coll., Fredonia, N.Y. Dept. of Biolo-

gy. S. A. Nicholson, and D. G. Best. Bull Torrey Bot Club. Vol 101, No 2, p 96-100,

Descriptors: *New York, *Roots, *Le Growth rates, Lakes, Water pollution effects. Identifiers: *Chatauqua Laket Lake(NY). *Macrophytes, Potamogeton-richardsonii, Shading, Vallisneria-americana.

Root:shoot, Root:shoot, Leaf:shoot, and leaf surface area:weight ratios were consistent in Vallisneria americana and Potamogeton richardsonii from Chautauqua in all except the smallest individuals. Root:shoot ratio increased across the aquatic hydrosere, i.e., from submergent to floating emergent communities, but leaf area index (LAI) varied little. LAI in most undisturbed native communities ranged between 5-7 sq m/sq m but disturbed communities dominated by the alien Potamogeton crispus had LAI's of 11 sq m/sq m or more. Since these communities are very unstable and characterized by explosive growth, decreased life span, and spontaneous dieoff, and since P. crispus is an introduced species, the high LAI's may be maladjusted to local conditions. A community exhibiting high LAI's soon suffers excessive shading and spontaneous dieoffs.—Copyright 1974, Biological Abstracts, Inc. W75-11009

SOME OBSERVATIONS ON BEHAVIOR OF THE TREATED SEWAGE DISPOSED IN THE

Nihon Univ., Tokyo (Japan). Dept. of Fisheries. For primary bibliographic entry see Field 5B. W75-11020

EFFECT OF DDT AND M.S. 222 ON LEARNING A SIMPLE CONDITIONED RESPONSE RAINBOW TROUT (SALMO GAIRDNERI), Alberta Univ., Edmonton. Dept. of Zoology. P. G. McNicholl, and W. C. Mackay. Journal of the Fisheries Research Board of Canada, Vol 32, No 5, p 661-665, May 1975. 1 fig, 2

Descriptors: *Salmonids, *Rainbow trout, *DDT, *Toxicity, *Mortality, *Fish physiology, *Fish behavior, Laboratory tests, Design, Water pollu-

tion effects Identifiers: MS222, LD50, Learning rate, Conditioning experiments, Bioaccumulation.

Rainbow trout (Salmo gairdneri) were force fed, with and without M.S. 222 anesthesia, pellets containing DDT equivalent to 0, 10 and 100% of the

96-h LD50 dose of 0.03 mg DDT/g body weight. DDT at the LD50 dose significantly increased learning rate 48 and 72 h after treatment. Although the 10% LD50 group did not learn significantly faster than controls, their slightly improved learn-ing rate indicated a dose-dependent response curve. M.S. 222 did not affect learning rate of a simple conditioned response whether or not the anesthetic was combined with DDT. (Katz) W75-11025

D

E

ta Id ar fir

maf

TOXAPHENE EFFECTS ON GROWTH AND BONE COMPOSITION OF FATHEAD MIN-NOWS, PIMEPHALES PROMELAS,

Fish and Wildlife Service, Columbia, Mo. Fish-Pesticide Research Lab.

Journal of the Fisheries Research Board of Canada, Vol 32, No 5, p 593-598, May 1975. 1 fig, 3

Descriptors: Marine fish, *Minnows, *Fish physiology, *Bioassay, *Metabolism, *Growth rates, *Toxicity, *Halogenated pesticides, *Chlorinated hydrocarbon, Labor Water pollution effects, Insecticides. Laboratory tests, Identifiers: *Fathead minnows, Pimephales promelas, Tissue analysis, Bioaccumulation, *Toxaphene, *Organochlorine insecticides.

Fathead minnows *Pimephales promelas) were exposed to toxaphene (55-1230 ng/liter) in a flowposed to toxaphene (35-1230 ng/nter) in a now-through diluter system for 150 days. Growth was not affected by toxaphene for up to 90 days of ex-posure, but within 150 days it was significantly reduced at all concentrations. Collagen content of the backbone was decreased (P < 0.05), amino acid composition was changed, and calcium concentration was increased. Results suggest that toxaphene altered the development and quality of the backbone, and induced biochemical manifesta-tions of the 'broken-back' syndrome. (Katz) W75-11026

FACTORS INFLUENCING ACUTE TOXICITY ESTIMATES OF HYDROGEN SULFIDE TO FRESHWATER INVERTEBRATES,

Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife. D. M. Oseid, and L. L. Smith, Jr. Water Research, Vol 8, No 10, p 739-746, October 1974. 2 fig. 14 tab, 11 ref.

Descriptors: *Invertebrates, *Amphipoda, *Isopods, *Toxicity, *Hydrogen sulfide, *Bioassay, *Mortality, Aquatic animals, Environmental effects, Water pollution effects, Laborato-

Identifiers: Ephemeroptera, LC50, Survival rates, Sublethal level, Assellus militaris, Crangonyx richmondensis, Gammarus pseudolimnaeus, Baetis vagans, Ephemera simulans, Hexagonia limbata, Bioaccumulation.

Acute bioassay tests of hydrogen sulfide were run on freshwater invertebrates (Assellus militaris, Crangonyx richmondensis, Gammarus pseudolimnaeus, Baetis vagans, Ephemera simulans, and Hexagenis limbata. Size and type of test chamber, Hexagenis limbata. Size and type of test chamber, type of substrate for burrowing forms or those seeking shelter in gravel, oxygen concentration, pH, and season of collection influenced the sensitivity of organisms. Hydrogen sulfide exposure of sublethal levels reduced feeding activity of Gammarus. 96-h LC50 hydrogen sulfide concentrations ranged from 1.07 mg/l for Assellus to 0.020 mg/l for Regtis (K 21). mg/l for Baetis. (Katz) W75-11027

RELATIONS BETWEEN ALGAL POTIONS AND THE PH OF THEIR MEDIA, POPULA-Bor Ilan Univ., Ramat-Gan (Israel). Dept. of Life

Sciences. Z. Dubinsky, and J. Rotem. Oecologia, Vol 16, No 1, p 53-60, 1974. 5 fig, 27

Effects Of Pollution—Group 5C

Descriptors: *Algae, *Diatoms, *Hydrogen ion concentration, *Temperature, Laboratory tests, Environmental effects, Aquatic environment, Primary productivity, Water pollution effects, Pollutant identification.

Identifiers: Achnantes minutissima, Synedra radi-ans, Synedra ulna, Synedra acus, Cymbella affinis, Gomphonema parvulum

Natural, mixed algal populations (Achnantes minutissima, Synedra radians, S. ulna, Cymbella affinis, and Gomphonema parvulum) grew well in artificial media of different pH levels between 5 and 12. Algal growth caused marked changes in the pH of the culture media, raising the low pH values and lowering the high ones. Within 3-4 weeks all cultures reached the pH range of 8.5-11.0, while sterile controls retained a much wider range of 4.0-10.0. Final pH values and the rate of pH change were temperature dependent. (Katz) W75-11028

MERCURY CONTENT OF WHALES, (IN JAPANESE).

For primary bibliographic entry see Field 5B. W75-11029

THE INFLUENCE OF THE WARM COOLING WATER FROM A FOSSIL FUELED POWER PLANT ON OCEANOGRAPHIC CONDITIONS AND COMPOSITION OF PLANKTON IN OWASE BAY I. WATER TEMPERATURE IN RELATION TO DISTRIBUTION OF MICROPLANKTON, (IN JAPANESE), Shimonoseki Univ. of Fisheries (Japan).

A. Tsuruta, and S. Tawara.

The Journal of the Shimonoseki University of Fisheries, Vol 23, No 3, p 121-136, 1975. 7 fig, 2 tab, 10 ref.

Descriptors: Effluents, Waste water(Pollution), *Thermal pollution, *Thermal powerplants, *Primary productivity, *Secondary productivity, *Plankton, Copepods, Sampling, Environmental effects, Seasonal, Cooling water, *Water temperature, Water pollution effects, *Cooling water,

Identifiers: Warm cooling water, *Chromonadae, Copepoda nauplii, Bacillariophyceae, nauplii, Japan(Owase Bay).

The influence of warm cooling water from a fossil fueled power plant on oceanographic conditions and plankton in Owase Bay was investigated. The distribution of temperature of the water surface depended on the interaction of the warm cooling water, the Naka River, and the oceanic water. Plankton groups, chromonadae, showed seasonal variation. Copepoda nauplii and Bacilliariophyceae were less abundant in the area affected by the discharged water from the power plant than in the other areas. (Katz) W75-11030

COPPER TOXICITY IN BUSYCON CANALICU-

Rhode Island Univ., Kingston. Graduate School of

Oceanography. S. B. Betzer, and P. P. Yevich. The Biology Bulletin, Vol 148, No 1, p 16-25, February 1975. 6 fig, 2 tab, 13 ref.

*Copper, *Metals, *Gastropods, Descriptors: *Snails, *Toxicity, *Traces, Animal physiology, Lethal limits, Path of pollutants, Bioassay, Laboratory tests, Water pollution effects. Identifiers: 64Cu, *Busycon canalicalatum, Tissue analysis, Bioaccumulation, Histology.

The effects of high concentrations of copper in seawater upon channeled whelk, Busycon canaliculatum, were followed histologically, by determination of tissue Cu concentrations, and by tracing uptake with radioactively labelled copper (64Cu). Whelks showed a high resistance to ionic

Cu, with a tolerance limit between 200-500 micrograms/liter at normal temperatures for the exposure period of 54-77 days. At lethal concentration, Cu was accumulated at the gill and osphradium W75-11031

IMPACT OF THERMAL EFFLUENT FROM STEAM-ELECTRIC STATION ON A MARSHLAND NURSERY AREA DURING THE HOT SEASON,

Florida Univ. at Marineland, St. Augustine. C.V.

Whitney Marine Lab. W. E. S. Carr, and J. T. Giesel.

Fishery Bulletin, Vol 73, No 1, p 67-80, January 1975. 6 fig, 5 tab, 14 ref.

Descriptors: Effluents, Freshwater fish, *Bioassay, *Water pollution effects, *Thermal powerplants, *Seasonal, *Summer, *Marshes, Temperature, Laboratory tests, Environmental ef-

fects, *Thermal pollution.
Identifiers: *Steam-electric plants, Mullet, Silver-side, Spot, Atlantic menhaden, Silver perch, Atlantic tread herring, Mugil curema, Mugil cepha-

Fish were collected during the hot season from three similar marshland creeks situated at various distances from a steam-electric station and analyzed for species composition and for density biomass per unit area. 48 species were identified. In the thermally affected creeks, both the numbers and biomass of juveniles were 3-10 fold smaller than those obtained from the creek at ambient temperature. (Katz)

STUDIES ON TOXICITY OF SODIUM NIFURSTYRENATE (NFS-NA) IN CULTURED YELLOWTAIL (IN JAPANESE),

Nagasaki Univ. (Japan). T. S. Ishihara, S. Kashiwagi, and M. Yasuda.

Bulletin of the Faculty of Fisheries on Nagasaki University, No 37, p 17-22, August 1974. 5 fig, 4 tab, 10 ref. (English abstract).

Descriptors: *Fish, *Fish physiology, *Fish diseases, *Toxicity, *Organic compounds, Mortality, Aquaculture, Fish farming, Environmental ef-

fects, Water pollution effects.

Identifiers: *Yellowtail, *Sodium nifurstyrenate, NFS-Na, Bioaccumulation, Bacterial pseudotu-berculosis, Pasteurella piscicida.

Bacterial pseudotuberculosis, caused pasteurella piscicida was associated with serious pasteurena piscicia was associated with serious mortality of cultured young yellowtail during the summer months in many yellowtail farms. Sodium nifurstyrenate (NFS-Na) was effective against the pathenogenic organism. Determination of long-term toxicity of NFS-Na was sought. (Katz) W75-11034

UTILIZATION OF STREAM-BORNE BY CAYUGA

PHOSPHORUS BY CATUGA LAKE PHYTOPLANKTON, New York State Coll. of Agriculture and Life Sciences, Ithaca, N.Y. Ecology and Systematics Section.

J. P. Barlow

Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 714, \$3.25 in paper copy, \$2.25 in microfiche. Research Project Technical Completion Report. Cornell University Water Resources and Marine Sciences Center, August 1975. 7 p, 8 ref. OWRT A-053-NY(1). 14-31-0001-5032.

Descriptors: *Lakes, *Streams, *Phosphorus, *Phytoplankton, Ecosystems, Biota, Bioassay, Tributaries, Management, Runoff, Flow, Measurement, Sampling, Estimating, Surveys, Research, Photosynthesis, Temperature, Mixing, *New York, Eutrophication, Water pollution efIdentifiers: *Cayuga Lake(NY), Rainstorms, Transparency, *Salmon Creek(NY).

Studies indicate that in the tributaries to Cayuga Lake, most of the phosphorus discharged is in the particulate form, during periods of high runoff. The effect of stream-borne phosphorus on lake ecosystems on whether it can be utilized by lake biota. For efficient lake management, a better un-derstanding of the availability of phosphorus and its rate of introduction into lakes by streams is needed. Discussed are studies made to determine how much of the phosphorus introduced into Cayuga Lake by streams is available to phytoplankton. Salmon Creek was chosen for the initial studies; it supplies about 10% of the phosphorus input to the lake and is close to shore facilities at Portland Point. All observations were made just after rainstorms. Observed changes in abundance and rates of photosynthesis of lake communities supplied with phosphorus in various forms. 'Batch' cultures to estimate relative availability of phosphorus in stream water and continuous flow experiments to determine rates of utilization were used. Bioassay techniques are useful for determining potential utilization of alful for determining potential utilization of all colubthonous phosphorus by lake phytoplankton. The difference in composition of stream and lake water offers an excellent opportunity to make quantitative studies of the fate of stream quantitative studies of the fate phosphorus in the lake. (Bell-Cornell) W75-11036

PRELIMINARY INVESTIGATIONS INTO COPPER CYCLING IN INDIAN LAKE, MAS-SACHUSETTS: A LAKE TREATED ANNUALLY WITH COPPER SULFATE,

Massachusetts Univ., Amherst. Water Resources Research Center. For primary bibliographic entry see Field 5B. W75-11039

ADAPTATION OF COPEPOD POPULATIONS TO THERMAL STRESS,

Maryland Univ., Catonsville. Div. of Biological

B. P. Bradley.

Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 706, \$3.75 in paper copy, \$2.25 in microfiche, Maryland Water Resources Research Center, College Park, Technical Report No 34, (1975), 16 p, 6 tab, 9 ref. OWRT A-027-MD(1), 14-31-0001-5020.

Descriptors: *Copepods, *Thermal stress, *Adaptation, Temperature, *Salinity, *Thermal pollution, Water pollution effects. Identifiers: *Eurytemora affinis, Acclimation, Temperature tolerance.

The range of temperatures tolerated by the copepod Eurytemora affinis was found to increase with increasing salinity and with temperature ac-climation. Developmental temperature also had a positive influence, as did sex, at least at higher ac-climation temperatures. The effects of salinity and acclimation were independent. Female adults were equally or more tolerant than males and pre-adult stages were significantly (P < .01) more tolerant than adults. Thus, the range of successful reproduction, and so survival, probably depends on the tolerance range of adults. Considerable in-dividual flexibility, at <1 ppt and without prior acclimation, was demostrated by animals tolerating an increase in temperature from 3C to 33C in less hours. There was evidence of long-term (genetic) flexibility, which would allow the species to adapt to novel thermal environments.

SURVIVAL AND GROWTH RATE OF CHAN-NEL CATFISH AS A FUNCTION OF DIS-SOLVED-OXYGEN CONCENTRATION,

Arkansas Univ., Little Rock. Dept. of Electronics and Instrumentation.
R. W. Raible.

Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 708, \$3.75 in paper copy, \$2.25 in microfiche. Ar-kansas Water Resources Research Center, Fayettesville, Publication No 33, June 1975. 35 p, 13 fig, 7 tab, 7 ref. OWRT A-019-ARK(1), 14-31-0001-

Descriptors: *Dissolved oxygen, *Growth rates, *Channel catfish, Fish farming, *Mortality, Fish management, Water pollution effects.

Channel catfish were raised in water-recirculating systems for several periods of about six months duration each. Initial stock was fingerling size fish (10 to 20 grams). At dissolved-oxygen levels below 2.5 parts per million, mortality was high. Fish raised in tanks held at dissolved-oxygen levels between 3.0 and 6.8 parts per million showed in-creased gains of weight for each increment of added oxygen. Weight gains were as much as 50 percent higher at 6.8 parts per million compared with weights at 3.0 parts per million. Feed conversion was good in all cases. When feeding was limited to demand, feed conversion was about the same at all oxygen levels, indicating that reduced oxygen levels resulted in reduced appetites for those fish at lower oxygen levels. The dissolvedoxygen level should be held as close to saturation as circumstances allow for maximum gain rate. W75-11051

BIOCHROME ANALYSIS AS A METHOD FOR ASSESSING PHYTOPLANKTON DYNAMICS, PHASE II.

Arkansas Univ., Fayetteville. Dept. of Botany and

Bacteriology. R. L. Meyer

Available from the National Technical Informa tion Service, Springfield, Va. 22161, as PB-244 710, \$4.25 in paper copy, \$2.25 in microfiche. Ar-kansas Water Resources Research Center, Fayetteville, Publication No 32, June 1975. 58 p, 12 fig, 8 ref, 2 append. OWRT B-037-ARK(1), 14-31-0001-4060

Descriptors: *Phytoplankton, Reservoirs, Lakes, *Arkansas, *Algae, *Chlorophyll, Effluents, Eutrophication, Ammonia, Nitrates, Phosphates, Missouri, *Temporal distribution, *Spatial dis-Missouri, *Temporal distribution, *Spatial dis-tribution, Primary productivity, Land use, Water temperature, Dissolved oxygen, Silicates, Water pollution effects.

Identifiers: Beaver Lake(Ark), White River, *Biochrome analysis.

Selected chemical, physical and biological parameters were determined for a man-made lake, Beaver Lake, on the White River of Arkansas and Missouri. The research program determined the qualitative and quantitative aspects of the temporal and spatial distribution of the algal subcom-munities. The epipelic, epilithic, epizooic and metaphytic subcommunities had little influence on the euplanktonic subcommunity. The relationship between the qualitative and quantitative analysis of the biochromes chlorophyll-a, -b, and -c and the phytoplankton species clustered into biochrome sets is discussed. The temporal and spatial distributional patterns of temperature, oxygen, ammonia-N, nitrate-N, orthophosphate-P and silicates are described in parallel with the biological parameters. These data are related to land use practices on the two major feeder streams. One source is influenced by agricultural runoff and the other by suburbanization plus a sewage outfall from a small city. The effect of the transition from riverine to lentic conditions are also considered (See also W75-06073) W75-11052

PATHOGENIC FREE-LIVING AMOEBAE IN ARKANSAS RECREATIONAL WATERS,

Arkansas Univ., Fayetteville. Dept. of Zoology For primary bibliographic entry see Field 5A. W75-11053

INFLUENCE OF OIL ON NUCLEIC ACIDS OF ALGAE.

Institute of Biology of the Southern Seas, Odessa (USSR).

I. A. Davavin, O. G. Mironov, and I. M. Tsimbal. Marine Pollution Bulletin, Vol 6, No 1, p 13-15, January 1975. 6 tab, 10 ref.

Descriptors: *Algae, *Chlorophyta, *Rhodophyta, Plant physiology, Biochemistry, *Oil pollution, Water pollution effects, Analytical techniques, Laboratory tests, Primary productivity, Oil wastes, Pollutant identification.

Identifiers: Ulva lactuca, Grateloupia dichotoma, Polysiphonia opaca, DNA, RNA, Polymerization, *Nucleic acids, Biosynthesis, Tissue analysis,

Three species of algae, Ulva lactuca, Grateloupia dichotoma, and Polysiphonia opaca were exposed to 0.1, 1.0 and 10 ml/l concentrations of Romashkinskaya oil. DNA separation to determine the degree of polymerization was carried out for labile and stable DNA and total DNA. Quantitative determinations were made of nucleic acids. Oil appeared to inhibit biosynthesis of DNA and RNA and to modify the degree of polymerization of deoxyribonucleic acids. (Katz) W75-11080

A REEVALUATION OF THE COMBINED EF-FECTS OF TEMPERATURE AND SALINITY ON SURVIVAL AND GROWTH OF BIVALVE LAR-USING RESPONSE SURFACE TECHNIQUES.

Oregon State Univ., Corvallis. School of Oceanog-

R. G. Lough

Fishery Bulletin, Vol 73, No 1, p 86-94, January 1975. 9 fig, 3 tab, 9 ref.

Descriptors: *Growth stages, *Mollusks, Aquatic animals, *Temperature, *Salinity, *Larvae, Equations, *Clams, *Oysters, Water quality, Aquaculture, Environmental effects, Water pollution ef-

Identifiers: Bivalves, Tolerance studies, Mercenaria mercenaria, Mulinia lateralis, Survival rates, Sublethal limits.

The combined effects of temperature and salinity on larval survival and growth of Crassostrea virginica, Mercenaria mercenaria and lateralis as reported in the literature were critically examined using response surface techniques. The late veliger larvae generally have a greater tolerance to both temperature and salinity than the developing embryos. Each species shows its own characteristic change in temperature-salinity tolerance as it develops and approaches the range normally tolerated by adults as it matures. Maximum growth of the veliger larvae required higher temperatures and somewhat higher salinities than maximum survival. Differences in temperaturesalinity ranges estimated for maximum survival and growth were significantly different for all three species. In each case growth showed a sigtemperature-salinity interaction. nificant Response surface plots are given for early larvae survival and late veliger survival and growth. Inferences of tolerance studies are made to the fields of pollution and aquaculture. (Katz) W75-11081

STANDARD CURVES FOR NUVACRON, MALATHION, SEVIN, DDT, AND KELTHANE TESTED AGAINST THE MOSQUITO CULEX PIPIENS L. AND THE MICROCRUSTACEAN DAPHNIA MAGNA STRAUS,

Alexandria Univ. (Egypt). Faculty of Agriculture. For primary bibliographic entry see Field 5B.

ACCUMULATION OF CADMIUM. COPPER, MANGANESE AND ZINC BY FUCUS VESICULOSUS IN THE BRISTOL CHANNEL, Institute for Marine Environmental Research, Plymouth (England). For primary bibliographic entry see Field 5B. W75-11083

0.18

ppm

tents

cies

tivel

CRU

Alas

J.E.

Cop

Des

grov *Oi

lutio

Bio

coh

cor

deg

sat

the

me

tio

ter

DI

G

A COMPARISON OF EFFECTS OF ELEVATED TEMPERATURE VERSUS TEMPERATURE FLUCTUATIONS ON REEF CORALS AT KAHE POINT, OAHU.

Hawaiian Electric Co., Inc., Honolulu. Environmental Dept.

S. L. Coles.

Pacific Science, Vol 29, No 1, p 15-18, January 1975. 2 fig, 2 ref.

Descriptors: *Electric generators, *Temperature, *Thermal pollution, *Coral, Marine animals, Discharge(Water), Water pollution effects, Environmental effects, Mortality, Lethal limit, Moni-

Identifiers: *Pocillopora meandrina, Sublethal ef-

Bottom temperature and the condition of live corals in the vicinity of the discharge plume from an electric generating station were monitored. Mortality to Pocillopora meandrina was no greater under conditions of maximum thermal enrichment near the living reef fringe in the discharge area (1-2 m depth) than in an area (4-5m depth) more distant from the discharge. Although bottom temperatures in the discharge area continually varied 3-4 degrees within minute periods during every low tide, live corals seldom encountered temperatures exceeding 31 degrees C. The limited damage indicated that upper absolute temperatures are more critical in producing coral damage than are shortterm temperature shocks near upper lethal limits. (Katz) W75-11084

ABSORPTION AND ELIMINATION OF PHOTODIELDRIN BY DAPHNIA AND GOLD-

Univ., Chicago. Dept. of Biological Sciences.

For primary bibliographic entry see Field 5B. W75-11085

UPTAKE OF CADMIUM, ZINC, COPPER, LEAD AND CHROMIUM IN THE PACIFIC OYSTER, CRASSOSTREA GIGAS, GROWN IN THE TAMAR RIVER, TASMANIA,

Tasmanian Dept. of the Environment, Hobart For primary bibliographic entry see Field 5B. W75-11086

STUDIES ON THE INORGANIC COMPONENTS OF MARINE ANIMALS-III, ON THE CON-TENTS OF CADMIUM, ZINC, COPPER, LEAD AND IRON IN MUSCLE AND VISCERA OF MARINE ANIMALS CAPTURED IN THE WEST SEA AREA OF KYUSHU, (IN JAPANESE),

Nagasaki Univ. (Japan).

Nozaki, and S. Miyahara. Bulletin of the Faculty of Fisheries of Nagasaki University, No 38, p 117-120, December 1974. 2

Descriptors: Aquatic animals, *Metals, Heavy metals, *Copper, *Cadmium, *Zinc, *Lead, *Iron, Animal physiology, Laboratory tests, Path of pol-lutants, Water pollution effects.

Identifiers: *Bioaccumulation, *Tissue analysis, Muscle, Viscera, *Japan(West Sea Area-Kyushu).

Cadmium, zinc, copper, lead and iron content of muscle and viscera of marine animals from the West Sea area of Kyushu were investigated. Results were as follows: the contents of Cd, Zn,

Effects Of Pollution-Group 5C

Cu, Pb, and Fe in muscle of 31 species were 0.01-0.18 ppm, 2.23-15.89 ppm, 0.48-7.25 ppm, 0.10-0.96 ppm and 5.08-50.62 ppm, respectively. The contents of Cd, Zn, Cu, Pb and Fe in viscera of 10 species were 0.18-0.39 ppm, 8.12-22.80 ppm, 0.79-4.69 ppm, 0.11-1.12 ppm and 23.68-152.37 ppm respectively. (Kat W75-11087 (Katz)

EFFECTS OF SOME COMPONENTS OF CRUDE OIL ON YOUNG COHO SALMON, Alaska Univ., College. Dept. of Biological

J. E. Morrow, R. L. Gritz, and M. P. Kirton.

Copeia, No 2, p 326-331, 1975. 1 fig, 2 tab, 8 ref.

Descriptors: "Salmonids, "Salmon, "Juvenile growth stage, "Organic compounds, "Toxicity, 'Oil wastes. Fish physiology, Fish behavior, En-vironmental effects, Laboratory tests, Water pollution effects, Pollutant identification.

Identifiers: *Coho salmon, Oncorhynchus kisutch, Bioaccumulation, Tissue analysis, Blood analysis,

Among oil components tested for toxicity to young coho salmon, Oncorhynchus kisutch, aliphatic compounds produced no significant mortalities. Mono-cyclic aromatics were generally toxic; the degree of toxicity increasing with the degree of unsaturation. It was suggested that the toxicity of these substances resulted through alteration of cell membrane permeability, especially in the gills. This resulted in a rapid increase in the concentration of monovalent ions in blood and probably interfered with CO2-HCO3 regulation. The behavior of fish treated with the various pure substances was an accelerated and exaggerated version of the behavior under crude oil. (Katz) W75-11088

THE EFFECTS OF CRUDE OILS AND THE DISPERSANT COREXIT 8666 ON SEA URCHIN GAMETES AND EMBRYOS,

Tromso Univ. (Norway). Inst. of Biology and Geology

S. Lonning, and B. E. Hagstrom.

Norwegian Journal of Zoology, Vol 23, No 2, p 121-130, April 1975. 9 fig, 2 tab, 14 ref.

Descriptors: Marine animals, *Growth stages, *Embryonic growth stage, *Toxicity, Animal physiology, Microscopy, Oil wastes, Environmental effects, Laboratory tests, Water pollution ef-

Identifiers: *Sea urchins, Psammechinus miliaris, Psammechinus lividus, *Corexit 8666, *Gametes, Embryogenesis, Fertilization, *Oil dispersants, Bioaccumulation.

The gametes and embryos of sea urchins, Psammechinus miliaris and P. lividus, were used to determine the effects inflicted by Kuwait and Ekofisk crude oil and/or the oil dispersant Corexit 8666. In most experiments the substances were present throughout the development, but also short-term treatments were carried out. The test substances had a moderate effect on fertilization and early development, whereas harmful influences were observed during the further differentiation of the embryo. The ultramicrographs did not indicate any morphological changes in the cytoplasm after oil treatment. Corexit 8666 brought about an increase and an aggregation of oil droplets within the cells. (Katz) W75-11090

THE EFFECTS OF OIL DISPERSANTS ON THE CELL IN FERTILIZATION AND DEVELOP-MENT.

Tromso Univ. (Norway). Inst. of Biology and Geology

S. Lonning, and B. E. Hagstrom. Norwegian Journal of Zoology, Vol 32, No 2, p 131-134, April 1975. 2 tab, 10 ref. Descriptors: *Marine fish, *Marine Animals, *Animal physiology, *Fish physiology, *Embryonic growth stage, *Fish eggs, Oil wastes, Environmental effects, Water pollution effects, Environmental effects, Water pollution effects, Laboratory tests, Microscopy, Mortality. Identifiers: *Sea urchins, *Oil dispersants, Stron-

gylocentrotus draebachiensis, Strongylocentrotus pallidus, Gradus morrhua, Pleuronectes platessa, *Fertilization, *Gametes, Embryogenesis, Bioaccumulation.

The effects of oil dispersants were tested on larvae from sea urchins (Strongylocentrotus droebachiensis and S. pallidus) and marine fishes (Gadus morrhua and Pleuronectes platessa). The substances used were: BP1100, BP1100X, Corexit 8666, Corexit 7664, Dasic slickgone LT 2, Emulsol/Isopar M, Emulsol with Shellsol, Finasol OSR-2. and Superb Universal Cleaner. All substances affected the fertilization of the sea urchins negatively, and during development inhibition of skeleton and endoderm was often registered. Both in larvae from sea urchins and fishes some sub stances caused pathological larvae and rapid cytol-W75-11091

ENDEMIC NEPHROPHATHY AND ITS RELA-TION TO THE CONTAMINATION OF WELL WATER BY PHENOLIC COMPOUNDS IN BARSA-ARAE (NEFROPATIA ENDEMICA SI RELATIA CU IMPURIFICAREA PRIN COM-POUSI FENOLICI IN APELE FINTINILOR DIN COMUNA BARSA-ARAD),

For primary bibliographic entry see Field 5B. W75-11105

AFRICAN SOUTH EUTROPHICATION PROBLEMS: A PERSPECTIVE,

National Inst. for Water Research, Pretoria (South

D. F. Toerien

Water Pollution Contol, Vol 74, No 2, p 134-142, 1975. 2 fig, 7 tab.

Descriptors: *Eutrophication, Water pollution sources, Nutrient removal, Municipal wastes, Phosphorus, Aquatic algae, Oligotrophy, Nutrients, Industrial wastes, Africa, Impoundments

Identifiers: *South Africa.

The problem of eutrophication in South Africa is discussed in terms of the nature and prevention of the problem, the restoration of eutrophic im-poundments, present and future levels of eutrophication in South African waters, and a comparison of two South African impoundments. The following conclusions were made: eutrophication is a danger to the water quality of South African impoundments; the extent of this danger must be determined; most impoundments in South Africa are still oligotrophic; the eutrophic impoundments are those which receive effluents from urban-industrial complexes; phosphorus is presently the most important algal growth-limiting nutrient; oligotrophic conditions were found to exist below 30 microg-P/liter and eutrophic conditions above 75 microg-P/liter; the range of eutrophication problems already experienced include problems in water treatment, aesthetics, recreation, water weeds, livestock losses, tastes, and odors; the population and per capita were consumption increases expected will lead to more effluents reaching impoundments and to more eutrophica-tion problems unless corrective measures are taken; eutrophication problems have a complex nature and their control is intimately associated with nutrient addition and economics; prevention of eutrophication problems can only be effected through the prevention of enrichment; successful prevention requires detailed knowledge of the specific impoundments under consideration; and, decisions to restore eutrophic lakes depend on many factors such as the uses of the water and the financial implication of restoration techniques. (Orr-FIRL) W75-11131

TENSIDS (SYNDETS) AND THE WATER POL-LUTION PROBLEM, (GESUND-HEITLICHE ASPEKTE DES TENSID-GEBRAUCHS), Bundesgesundheitsamt, Berlin (West Germany). Institut fuer Wasser-, Bodenund Lafthygiene. For primary bibliographic entry see Field 5D. W75-11134

BIOMAGNIFICATION OF DIELDRIN RESIDUES BY FOOD CHAIN TRANSFER FROM CLAMS TO BLUE CRABS UNDER CON-TROLLLED CONDITIONS.

Texas A and M Univ., College Station. Dept. of Biochemistry and Biophysics.

S. R. Petrocelli, J. W. Anderson, and A. R. Hanks. Bulletin of Environmental Contamination and Toxicology, Vol 13, No 1, p 108-116, January 1975. 1 fig, 3 tab, 27 ref.

Descriptors: *Mollusks, *Clams, Crustaceans, *Crabs, *Dieldrin, *Chlorinated hydrocarbon, Pesticides, *Food chains, *Bioassay, Design, Estuaries, Laboratory tests, Environmental effects, Pesticide residues, Water pollution effects. Identifiers: Rangia, Callinectes, *Blue crab, Biomagnification, Bioaccumulation, Tissue analy-

The possibility of biological magnification of dieldrin residues in a two-part food chain consisting of clams, Rangia, and blue crabs, Callinectes, was tested. Clams with dieldrin concentrations of 193 and 181 micro-g/kg were fed to the crabs. Crabs incorporated 47%-78% of the dieldrin and concentrated dieldrin residues to 4.7 and 6.8 times the daily dose after 10 days of feeding. Implications of magnification of organochlorine insecticide residues were discussed. (Katz) W75-11135

SOME EFFECTS OF COPPER ON THE POLYCHAETE PHYLLODOCE MACULATA,

Stirling Univ. (Scotland). Dept. of Biology. D. S. McLusky, and C. N. K. Phillips. Estuarine and Coastal Marine Science, Vol 3, No 1, p 103-108, February 1975. 1 fig, 1 tab, 7 ref.

Descriptors: *Worms, Aquatic animals, *Metals, *Copper, *Bioassay, *Toxicity, *Lethal limit, Physiology, Laboratory tests, Water Pollution effects.

Identifiers: *Polychaetes, *Phyllodoce maculata, Bioaccumulation, Tissue analysis, LC-50, LT-50, Sublethal concentrations.

The lethal concentration of copper (0.08-1.00 part/million) and the accumulation of copper various uptake concentrations for the polyclaete Phyllodoce maculata were determined. The rate of uptake may be the lethal factor, rather than the amount of copper accumulated. (Katz) W75-11136

THE EFFECTS OF EXPERIMENTAL BLACKFLY (DIPTERA: SIMULIDAE) LARVICIDING WITH ABATE, DURSBAN, AND METHOXYCHLOR ON STREAM INVER-TEBRATES, Waterloo Univ. (Ontario). Dept. of Biology.

R. R. Wallace, A. S. West, A. E. R. Downe, and H. B. N. Hynes.

Can Entomol, Vol 105, No 6, p 817-831, 1973.

Descriptors: *Diptera, Invertebrates, Water pollution effects, *Larvicides, Aquatic insects, Ecology, *Insecticides, Aquatic drift, Sampling. Identifiers: *Abate, *Blackfly, *Methoxychlor, Simuliidae.

The effects of Abate, Dursban, and Methoxychlor and their diluents on blackfly larvae and on 'non-

Group 5C-Effects Of Pollution

target' stream invertebrates were evaluated by means of cone, rock, Surber, and drift samples. Blackfly larvae were found in many post-treatment Surber samples, although concurrent cone and rock samples often indicated that blackfly larvae were either greatly reduced in numbers or eradicated from the streams. The insecticide diluents (heavy aromatic naphtha and fuel oil) caused detachment of blackfly larvae from cones, but less than that obtained when insecticide was added. The heavy post-treatment drift of 'non-target' invertebrates in treated streams was indicative of a considerable disturbance to the aquatic invertebrate community. However, post-treatment samples indicated that the 'non-target' organisms studied were not eradicated from the streams. There were several indications that the catch of invertebrate drift was altered by pools, which possibly exerted a delaying action on drifters in the treated streams. Most of the drifting invertebrates found in post-treatment drift nets were dead.-Copyright 1974, Biological Abstracts, Inc. W75-11157

WATER POLLUTION FROM NONPOINT SOURCES.

Midwest Research Inst., Kansas City, Mo. For primary bibliographic entry see Field 5B. W75-11158

DISSOLVED GAS SUPERSATURATION AND DILUTION IN THERMAL PLUMES FROM STEAM ELECTRIC GENERATING STATIONS, Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.

For primary bibliographic entry see Field 5B. W75-11159

CONCENTRATION AND GENERA OF ALGAE IN SELECTED ILLINOIS STREAMS, 1971-1973, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 5A. W75.11165

MUTAGENS AND POTENTIAL MUTAGENS IN THE BIOSPHERE: I. DDT AND ITS METABOLITES, POLYCHLORINATED BIPHENYLS, CHLORODIOXINS, POLYCYCLIC AROMATIC HYDROCARBONS, HALOETHERS,

National Center for Toxicological Research, Jefferson, Ark.

For primary bibliographic entry see Field 5B. W75-11170

MUTAGENS AND POTENTIAL MUTAGENS IN THE BIOSPHERE: II. METALS--MERCURY, LEAD, CADMIUM AND TIN,

National Center for Toxicological Research, Jefferson, Ark.

For primary bibliographic entry see Field 5B. W75-11171

AMMONIA EXCRETION BY ZOOPLANKTON AND ITS SIGNIFICANCE TO PRIMARY PRODUCTIVITY DURING SUMMER, Washington Univ., Seattle. Dept. of Oceanog-

raphy.

M. Jawed.

Available from the National Technical Information Service, Springfield, Va 22161 as RLC-2225-T26-12, 84.00 in paper copy, S2.25 in microfiche. Report RLO-2225-T26-12, (1973), 26 p, 2 fig. 2 tab, 23 ref. NR 083 012. AEC AT(45-1)2225, NO0014-67-A-0103-0014.

Descriptors: *Marine microorganisms, *Zooplankton, *Pacific Ocean, *Ammonia. *Nitrogen, Primary productivity, Shallow water, Plankton, Jelly fish, Columbia River, Nitrates, Oceans, *Washington, *Oregon, Coasts, Upwelling, Entrainment.

Identifiers: *Ammonia excretion, Nutrient sources.

To understand biological processes in relation to environmental factors, ammonia excretion by zooplankton was studied off the coasts of Washington and Oregon. Ammonia excretion rates off these coasts varied from 0.16-0.60 micrograms of ammonia nitrogen per mg dry weight/day for planktonic animals and 0.02 to 0.06 for jellyfish. The effect of size of the various species was not observed. Seawater ammonia concentration was low in offshore regions. In the Columbia River plume offshore, excreted ammonia accounted for about 90% of the total nitrogen requirements for observed primary productivity in the summer. Ammonia excreted by zooplankton in the upper oceanic waters contributed about 36% of the total nitrogen requirements of primary production. In inshore waters, nitrogenous excretion by zooplankton was relatively unimportant. Replenishment of nitrogenous sources in surface layers of inshore waters was greatly enhanced by river-induced entrainment and wind-induced upwelling of deeper water. (Buchanan-Davidson-Wisconsin) W75-11187

DISSOLVED ORGANIC MATTER AND LAKE

METABOLISM, Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.

R. G. Wetzel. Available from the National Technical Information Service, Springfield, Va 22161 as COO 1599-79, \$4.00 in paper copy, \$2.25 in microfiche. Technical Progress Report COO-1599-79, April 1973-March 1974. 31 p, 1 fig, 2 tab, 29 ref. AEC AT(11-1)1599.

Descriptors: *Dissolved solids, *Organic matter, *Lakes, *Metabolism, *Michigan, *Eutrophication, Cycling nutrients, Organic compounds, Nutrient requirements, Chemical analysis, Phytoplankton, Sessile algae, Nitrogen cycle, Carbon cycle, Inorganic compounds, Bacteria, Chelation, Growth rates, Sediments, Littoral, Photosynthesis, Productivity, Decomposing organic matter, Inflow, Deep water, Detritus, Trophic level. Identifiers: *Lawrence Lake(Mich).

This annual report describes investigations on qualitative and quantitative cycling of particulate and dissolved organic matter in lakes. Interactions of dissolved organic matter with inorganic nutrient cycling and regulation of the metabolism of micro-and macroflora were studied. Sources, fates, pathways, and interactions of dissolved organic matter in inorganic chemical cycling, al-lochthonous sources, metabolism, and inputs to lake systems of increasing stages of eutrophication as related to nutrient physiology and metabolism of phytoplankton, sessile algae, macrophytes, and bacteria were studied. Regulatory mechanisms of growth and rates of carbon recycling were evaluated by studying quantitative control mechanisms among microflora of pelagial zones of lakes of eutrophy, progressively greater photosynthetic producer-decomposer and allochthonous inorganic-organic influxes and their biotic processing. Quantification of the dynamic carbon fluxes among these components and their rate control mechanisms was fundamental to the elucidation of the rate functions of lake eutrophication. A functional detrital carbon budget was evaluated for an oligotrophic lake Clawrence Lake, Michigan) and is being extended to more productive lakes. The fate and mechanisms regulating the qualitative and quantitative utilization and losses of organic carbon are being studied. (Buchanan-Davidson--Wisconsin) W75-11188

INVESTIGATION OF THE INFLUENCE OF THERMAL DISCHARGE FROM A LARGE

ELECTRIC POWER STATION ON THE TEM-PERATURE AND NEAR-SHORE CIRCULA-TION OF LAKE MICHIGAN,

Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.

C. H. Mortimer, and G. K. Sato.

Available from the National Technical Information Service, Springfield, Va 22161 as COO-2158-9, \$4.00 in paper copy, \$2.25 in microfiche, Progress Report COO-2158-9, July 1973-September 1973. 4 p, 1 fig, AEC AT(11-1)2158. UN Bui Ari J. (

In: on Oc Ex 95,

De lan Fis Ba

me *G Id

> re cit wi ba sh

Descriptors: *Lake Michigan, *On-site data collections, Technology, *Thermal pollution, Water circulation, Electric powerplants, *Wisconsin, Heated water, Water temperature, Wind velocity, Anemometers, Currents(Water), Current meters, Histograms. Identifiers: *Oak Creek Power Plant(Wis).

This quarterly progress report on nearshore circulation of Lake Michigan near the Oak Creek Power Plant, Oak Creek, Wisconsin presents information on data obtained from amemometers at the Milwaukee Airport and at the power plant. The data is being processed, analyzed, and compared with previous data. Progressive vector diagrams will be made to provide information on the characteristics of nearshore circulation. Instead of developing histograms of current direction and speed, a computer program will be developed to compute vector frequency plots. These plots will combine speed and direction frequencies into one diagram and indicate dominant speeds and directions. Difficulties concerning the premature release of current meters and their defective recording are being investigated. (Buchanan-Davidson--Wisconsin) W75-11190

THE ROLE OF PLANKTONIC PROTOZOA IN THE MARINE FOOD CHAIN. SEASONAL CHANGES, RELATIVE ABUNDANCE, AND CELL SIZE DISTRIBUTION OF TINTINNIDA, New York Aquarium, Brooklyn. Osborn Labs. of Marine Sciences.

K. Gold.

Available from the National Technical Information Service, Springfield, Va 22161 as COO-3390-7, \$4.00 in paper copy, \$2.25 in microfiche. Progress Report COO-3390-7, May 1972-April 1973. 21 p, 17 fig. AEC AT(11-1)3390.

Descriptors: *Biological communities, *Marine microorganisms, *Protozoa, *Systematics, Dimensions, Sea water, Neritic, Cultures, Invertebrates, Surf, Measurement, Coasts, Diets, Growth rates, Seasonal, Water temperature, *New York.

Identifiers: *Tintinnida, Codonella acuta, Stenosemella oliva, Tintinnopsis beroidea, Tintinnopsis tubulosa, Coney Island(NY), Eurythermal organisms.

Tintinnida species identified in the winter-spring plankton community collected beyond the suffacone near Brooklyn, New York, were Codonella acuta, Stenosemella oliva, Tintinnopsis beroidea, and T. tubulosa, in order of relative abundance. Plots of species lorica length and width showed variability in species size. In February the Codonella population increased and in April its dimensions were more variable. The width dimension was a better guide to speciation than length or length:width ratio. Length was an excellent guide to cell growth and division. During winter T. tubulosa was actively growing with both juvenile and older forms but in April no juvenile forms were present. Time of exposure to elevated temperature had little effect on size distribution of T. tubulosa. Casting off empty loricas was independent of temperature and cell age. When T. beroidea and T. tubulosa were grown in culture, growth was proportional to amount of phytoflagellate food and not affected by diatom flora present; neither probiotic or predatory effects were observed between the species. Food requirements increased at 15C.

At 20C cell yield declined; T. tubulosa could not withstand the grazing pressure of Strobilidium.
(Buchanan-Davidson--Wisconsin)

UNISEX STUDIES ON THE WHITE AMUR, Bureau of Sport Fisheries and Wildlife, Stuttgart, Ark. Fish Farming Experiment Station. J. G. Stanley.

In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 89-95. August 1974, 5 fig.

Descriptors: *Aquatic weed control, *Fish steri-Descriptors: "Aquate weed control, "rish stocking, fish diets, Cycling nutrients, Energy budget, Bass, Nitrogen, Phosphorus, Oxygen requirements, Biomass, Number fish per acre, Carp, Georgia, *Arkansas.

*Unisex Identifiers: *White amur, *Unisex *Gynogenesis, Elodea, Goldfish, Hybrid fish. Identifiers.

The performance of white amur without danger of reproduction and permanent establishment, artificial gynogenesis, requiring contact of spermatozoa with ovum without fusion, was studied using white bass or x-irradiated milt on eggs, followed by cold shock, but yields were small. Hybridization between goldfish-amur and common carp-amur produced successful crosses, with carp-amur showing better survival; aquatic vegetation was their primary food. Amur excreted more nitrogen than was present in the elodea they consumed, but most of the phosphorus was excreted. Amur digested vegetation inefficiently but converted aslated food into fish biomass well, due to low metabolic rates. They stopped feeding at approximately 2.5 ppm oxygen. In Georgia stocking approximately 100 pounds amur/acre was ineffective in controlling elodea, thus higher stocking rates would be required where winter plant die-offs do not occur. At the Fish Farming Development Center, Kelso, Arkansas 55 or more fin-gerlings/acre amur controlled Pithophora, Najas, uckweed. The native fish yield was ten times higher in ponds with 55-96 amur fingerlings/acre; more amur decreased fish yields and depleted vegetation. Amur did not eat the same food as channel catfish, largemouth bass, bluegill, or green sunfish, but competed with buffalo and carp. (See also W75-08289) (Buchanan-Davidson-Wisconsin)

HERBICIDE CHEMICALS AND THEIR EF-FECT ON THE AQUATIC ENVIRONMENT, Bureau of Sport Fisheries and Wildlife, Washington, D.C. Div. of Fishery Research. C. R. Walker.

C. R. Walker. In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p C3-C18, August 1974. 72 ref.

Descriptors: *Toxicity, *Herbicides, *Aquatic weed control, *Aquatic environment, 2-4-D, Pesticide residues, Pesticide toxicity, Pesticide removal, Pesticides, Persistence, Insecticides, Polychlorinated biphenyls, Chlorinated hydrocarbon pesticides, Catfishes, Carbamate pesticides, 2-4-5-T, Minnows, Sunfishes, Fish, Channel catfish, Bass, Fish control agents, Antimycin A, Aquatic insects, Food chains, Water pollution effects.

A critical relationship exists between the chemical character of water and the flora and fauna it supports. Biocide effects on aquatic environment must be studied and safety and environmental quality considered in pesticide selection. No registered aquatic herbicide meets criteria for all uses or has been labeled with residue to tolerance limits in water, fish, or shellfish. The fate of herbicide residues and effects on fish, fish-food organisms, and other aquatic organisms must be ascertained. Residue toxicities of different 2.4-D esters on various fish differ. The butoxyethanol ester of 2,4-dichlorophenoxyacetic acid (2,4-D BEE) was only present in fish livers; other organs contained 2,4-D acid. Excretion occurred via the kidneys and gills. High tissue 2,4-D BEE residues tranquilized fish. Hydrolysis of 2.4-D BEE in water was rapidly accelerated by the presence of fish. Basic research on the effects of weed control methods on plant nutrients and energy in aquatic ecosystems and selective use of biocides to maximize fish yields is needed. Effects of fish toxicants, insecticides, and herbicides have been studied. Pesticides must be adequately labeled, screened, and evaluated. Cost-benefit aspects of pesticide use must include analysis of energy flow limiting factors and biomass produced at each trophic level with respect to the species managed. (See also W75-08289) (Buchanan-Davidson-W75-11211

PRIMARY PRODUCTION IN LAKES ONTARIO AND ERIE: A COMPARATIVE STUDY, Canada Centre for Inland Waters, Burlington

(Ontario).

W. A. Glooschenko, J. E. Moore, M. Munawar, and R. A. Vollenweider.

Journal of the Fisheries Research Board of Canada, Vol 31, No 3, p 253-263, 1974. 10 fig, 2

Descriptors: *Lake Ontario, *Lake Erie, *Great Lakes, *Primary productivity, Photosynthesis, Measurement, Ecological distribution, Spatial distribution, Temporal distribution, Carbon, Trophic level, Eutrophication, Seasonal, Annual succession, Fluctuations, Chlorophyll.

A study of temporal and spatial variations in primary production in Lakes Erie and Ontario is described. Surface and integral measurements using C14 were used to compare productivity in terms of trophic status. Lake Ontario primary production was low in winter, reached a maximum in midspring, declined in summer, and increased in fall. Inshore water production rate increased more in spring and early summer, with a greater maximum reached earlier than in offshore waters. Assimilation numbers (mg C fixed/mg chlorophyll-a per hour) had a yearly range of 1.2-1.6. Primary production in both lakes showed a linear relationship to chlorophyll-a. Lake Erie primary production varied: the Eastern Basin production was highest in spring, declined in midsummer, and increased slightly in fall; the Western Basin had a midsummer maximum; and the Central Basin had peaks in late summer and early fall. Assimilation numbers showed a westerly increase. Surface production was equal in both lakes until early summer and in November-December, but integral photosynthesis was higher in Lake Ontario. Lake Erie summer production was higher. From April-December the total estimated yield for Lake Ontario was 170 g C/sq m and for the Lake Erie basins, 160, 210, and 310 g C/sq m. (Buchanan-Davidson-Wisconsin) W75-11217

MICROBIOLOGICAL EXAMINATION OFFSHORE LAKE ERIE SEDIMENTS. Canada Centre for Inland Waters,

B. J. Dutka, J. B. Bell, and D. L. S. Liu. Journal of the Fisheries Research Board of Canada, Vol 31, No 3, p 299-308, 1974. 5 fig, 2 tab,

Descriptors: *Microorganisms, *Lake Erie, *Lake sediments, Cores, Bacteria, Oxygen demand, Great Lakes, Distribution patterns, Oxidation-reduction potential, Microbiology.

Bacterial distribution and density were studied in sediment cores of the Central and Western Basins of Lake Erie. Eh values indicated cores were devoid of oxygen and oxygen uptake rates differed between the Central and Western Basin sediments. The biological oxygen demand in surface sediments was 75% and in the lower sediments, 11-45%. Heterotrophic bacteria concentrations were proportional to available organic matter and reflected the number of heterotrophs surviving by facultative mechanisms in a deoxygenated environment. Sulfate reducing bacteria were constant through the core. Large organic sulfur reducing populations indicated an organic matter supply. Sulfur oxidizing bacteria were high in the top three cm. Densities of nitrogen cycle bacteria at sediment-water interfaces were similar at both basins but ammonifying and denitrifying bacteria in lower core layers varied. Nitrifying bacteria were found throughout the cores. Phosphate solubilizing bacteria were high in the top 5-6 cm and decreased below 10 cm. Iron and manganese oxidizing bacteria were low in deeper sediments. Overlying waters contained fewer bacteria than those in surface sediments. Offshore sediments not directly influenced by land inputs contained similar homogeneously distributed bacterial populations which varied little between surface sedi-ment and the 5 cm level. (Buchanan-Davidson-Wisconsin) W75-11218

ALGAE IN BALTIMORE'S RESERVOIRS,

Baltimore City Dept. of Public Works, Md. Water Supply Treatment and Pumping Div. J. A. Valcik.

Journal of the American Water Works Association, Vol 67, No 3, p 109-113, 1975. 2 fig, 12 ref.

*Water Descriptors: treatment, Reservoirs, "Nuisance algae, "Maryland, Agricultural runoff, Chlorides, Nitrates, Runoff, Hydrogen ion concentration, Water pollution Water pollution sources, Industrial wastes, Odor, Water costs, Municipal wastes, Potable water, Chlorella, Color, Land use, State jurisdiction, Legislation, Diatoms, Chlorophyta, Cyanophyta, Eutrophication. Identifiers: *Baltimore(Md), Loch Raven Reservoir(Md), Prettyboy Reservoir(Md).

Reservoirs supplying water for Baltimore, Maryland experience problems related to seasonal oc-currences of nuisance algae. Surveys in 1970-1971 showed that most of the pollution then was the result of poor agricultural practices; industrial and domestic waste water effluents were secondary nutrient sources. Water in the Montebello Filter Plant gradually deteriorated, and in 1974 a serious algal problem was observed in raw water entering the plant. Chlorella predominated, followed by Oocystis, and a greenish-yellow color was present in sedimentation basin effluents. A green algal bloom occurred in the Loch Raven Reservoir. Seasonal application of an algicide, reservoir aeration, use of a coagulant, and activated carbon were considered as treatment measures. Algal blooms were observed in the Liberty Reservoir in the s, and diatoms caused reductions in the filterrun times of the Ashburton Filter Plant in 1967-1968. Similar problems are expected to increase in the future. Correctional treatment is costly. State and local agencies must cooperate to limit discharges of nutrient wastes into watersheds by legislative control of land usage and land manage ment practices to limit discharges of nutrient wastes into the watersheds. (Buchanan-Davidson--Wisconsin) W75-11221

APPLICATION OF THE MANOMETRIC TECHNIQUE IN THE STUDY OF SEDIMENT OXYGEN DEPLETION, Canada Centre for Inland Waters, Burlington

(Ontario). D. Liu.

Canadian Research and Development, Vol 6, No 2, p 35-37, 1973. 6 fig. 1 tab, 10 ref.

Group 5C-Effects Of Pollution

*Analytical Descriptors: techniques. Manometers, *Bottom sediments, *Oxygen sag, *Oxygen demand, Hypolimnion, Measurement, Anaerobic conditions, Biochemical oxygen demand, Chemical oxygen demand, Carbohydrates, *Lake sediments, Lake Erie, Lake Ontario.

The results of the manometric technique used in oxygen budget research are described. In addition to showing the rate and extent of oxygen consumption, the effects of other environmental conditions, such as temperature, pH, etc., may also be ascertained. This technique was used to study Lakes Erie and Ontario sediments with regard to the profile of oxygen consumption in the sediment column, the differential of the biological oxygen consumption from the chemical oxidative process by the use of a metabolic inhibitor, and the correlation between carbohydrate content and the community respiration rate. A Gilson differential respirometer was used to study the profile of oxygen consumption in lake sediment to a depth of 20 cm below the water-mud interface. The high sensitivity of the manometric method (it will detect changes of 20 microgram oxygen) has an overwhelming advantage over the conventional titration method. But application to a real lake system depends on the solution of the problem of how to reproduce the lake mixing processes in the laboratory. Shaking or disturbance greatly increases the lake sediments' oxygen consumption rate, therefore caution must be exercised when considering plans to use mechanical dredging for the removal of polluted sediment from Lake Erie. (Auen-Wisconsin) W75-11222

THE EFFECTS OF THE FORMATION OF LAKE KAINJI (NIGERIA) UPON THE IN-DIGENOUS FISH POPULATION,

Ife Univ. (Nigeria). Kainji Dam Research Project. D. S. C. Lewis

Hydrobiologia, Vol 45, No 2/3, p 281-301, 1974. 3 fig, 18 ref.

Descriptors: *Fish populations, *Africa, *Post-impoundment, *Environmental effects, Reservoirs, Fish food organisms, Rivers, Succession, Prey fish, Herbivores, Bottom fish, Fish establishment, Fish types, Detritus, Omnivores, Carnivores. Identifiers: *Nigeria, *Lake Kainji(Nigeria), River Niger(Nigeria), Isectivores.

Closure of Kainji Dam resulted in conversion of 137 kilometers of the River Niger into Kainji Lake, thus transforming a fluvatile environment into a lacustrine environment. When reactions of each component of the fish population to the environmental transition were studied, profound changes in the relative abundance of many species were observed. The immediate changes were a decline in Mormyridae numbers, increases in numbers of Citharinidae (especially Citharinus citharus), Characidae (especially Hydrocynus forskali and Alestes baremose), Schilbeidae (especially Eutropius niloticus), and Lates niloticus; and a change in the relative abundance of various species of Mochochidae. After the lake had been in existence for a year, further recorded changes included a decline in numbers of Citharinidae (especially Citharinus citharus) and Lates niloticus, and increases in Characidae, Cichlidae (especially Tilapia galilaea), and clupeids. Overall population trends resulting from the lake's formation showed a decline in the number of bottom feeding insectivores, increase in the number of detritus feeders immediately after the lake was formed, followed by a decline; and an increase in numbers of planktivores, omnivores, and carnivores. The population changes had a number of features common to changes which occurred in other African man-made lakes. (Buchanan-Davidson--Wisconsin) W75-11223

ACID STRIP MINE LAKE RECOVERY,

Missouri Univ., Columbia. Dept. of Civil Engineering.
D. L. King, J. J. Simmler, C. S. Decker, and C. W.

Journal Water Pollution Control Federation, Vol 46, No 1, p 2301-2315, 1974. 11 fig, 1 tab, 20 ref. OWRT A-038-MO(3).

Descriptors: *Strip mine lakes, *Neutralization, *Coal mine wastes, Productivity, Hydrogen ion concentration. Chemical reactions. Pyrite. water treatment, Reduction(Chemical), Acid mine water, Mine acids, Clay minerals, Bacteria, Sulfur bacteria, Aluminum, Alkalinity, Bicarbonates, Vegetation effects, Nutrients, Reclamation, Organic matter, Hydrogen sulfide. Identifiers: *Lake rehabilitation.

Acid strip mine lakes formed by oxidation of iron-sulfur pyrites and marcasites left on the surface after coal removal can be made alkaline and sup port aquatic communities. Factors aiding this recovery process are clay minerals, reaction with alkali metal compounds, activity of sulfate-reducing bacteria, creation of anaerobic conditions. reducing conditions, depth of water, light, aluminum concentration, and formation of bicarbonate alkalinity. The amount of vegetated land near the lake, seasonal changes in temperature, wind-induced mixing, time, bacteria, and algal nutrients are also important. Recovery can be accelerated by the addition of organic matter. The carbon:nitrogen:phosphate ratio should be considered in choosing the organic material to be used. The advantages of accelerating the recovery process would be elevation of pH, loss of acidity and metals, and use of organic wastes. The major disadvantage is evolution of hydrogen sulfide, which may be controlled by limiting the amount of organic matter added to the lake. The recovered strip mine lake will be in an early eutrophic state. The biological, chemical, and physical interaction from acid formation to a recovered lake could be avoided by covering acid-producing materials with non-acid soil when coal is strip-mined. (Buchanan-Davidson--Wisconsin) W75-11224

THE GROWTH OF SOME EPIPHYTIC ALGAE IN A LAKE RECEIVING THERMAL EF-FLUENT.

Alberta Univ., Edmonton. Dept. of Botany. M. Hickman, and D. M. Klarer. Archiv fur Hydrobiologie, Vol 74, No 3, p 403-426,

1974. 12 fig. 2 tab, 44 ref.

Descriptors: *Periphyton, *Algae, *Lakes, *Thermal pollution, *Canada, Bulrushes, Water temperature, Growth rates, Period of growth, Powerplants, Seasonal, Light intensity, Nutrients. Wabamun(Alberta), *Lake Achnanthes minutissima, Oedogonium, Spirogyra, Gomphonema parvulum, Diatoma elongatum, capucina, Fragilaria vaucheriae, um tenue, Cocconeis placentula, Stigeoclonium tenue, Cocconeis placentula, Gomphonema gracile, Epithemia turgida, Mou-

Discharge of heated water into Lake Wabamun, Alberta, caused changes in the standing crop size of epiphyton associated with Scirpus validus and in the algal species composition. Seasonal growth cycles of twelve dominant species of epiphytic algae were studied using cell count data to determine effects of inflow of heated water on their growth. During winter in the heated areas nitratenitrogen, phosphate-phosphorus, and dissolved silica concentrations increased, reaching max-imum levels in the spring, then decreased during ice break-up. The longer growing season was responsible for the early development and early spring maxima of Achnanthes minutissima, Oedogonium, Spirogyra, Gomphonema parvulum, Diatoma elongatum, Fragilaria capucina, and F vaucheriae; extending autumn maximum of Stigeoclonium tunue into winter; and presence of

large populations of Cocconeis placentula and Gomphonema gracile from autumn through winter. Heated water adversely affected growth of Epithemia turgida and Mougeotia and benefited growth of Spirogyra and Stigeoclonium tenue.
Temperature alone did not account for all the differences when growth in heated and non-heated areas was compared; factors such as light intensity, daylength, and inorganic and organic nutrients in the water were also important. (Buchanan-Davidson--Wisconsin) W75-11225

Onl

zon

long

aut

abo

var

Ino

sati

tota

are

tie:

AN

GI Yo

gy K.

Pla tal

De *B

TI

pe

to th Ti

oi zi

IN SITU MEASUREMENT OF THE SETTLING VELOCITY PROFILE OF PARTICULATE OR-GANIC CARBON IN LAKE ONTARIO. Canada Centre for Inland Waters, Burlington

N. M. Burns, and A. E. Pashley. Journal of the Fisheries Research Board of Canada, Vol 31, No 3, p 291-297, 1974. 4 fig, 2 tab,

Descriptors: *Phytoplankton, *Settling velocity, Laboratory equipment, Particle size, Organic compounds, Carbon, Measurement, *Lake On-tario, On-site tests, Vertical migration, Ther-mocline, Epilimnion, Phosphorus, Nutrients. Identifiers: *Organic carbon.

Calm water settling velocity profiles of particulate organic matter were measured using special sampling bottles. To determine phytoplankton settling velocity under natural conditions, species, light conditions, cell concentrations, growth rate, nutrient concentrations, cell physiological state, zooplankton grazing effects, and density stratifi-cation must be considered. The sampling bottles had a horizontal dividing shutter, two triggers sensitive to small and large diameter messengers, and a vane assembly and swivel clamp which enabled it to rotate freely on the mooring line to line up with the current and suffer minimum vibration due to vortex-shedding before retrieving the bottles. Samples were subdivided into upper and lower portions so settling velocities could be calculated. The settling velocity profile of Lake Ontario varied between -0.4 and +2.0 m/day. Net settling velocities measured at the top of the thermocline were used to estimate net settling fluxes from the epilimnion; these varied between -0.074 +0.336 millimoles phosphorus/sq m/day. Net settling flux can differ from sedimentation flux out of epilimnion. Negative settling can add nutrients to the epilimnion during the stratified period. Set-tling flux and diffusion flux have similar magnitudes, occasionally acting together or in opposi-tion. (Buchanan-Davidson--Wisconsin)

A GENERAL DESCRIPTION OF SOUTHERN LAKE OLIGOTROPHIC LAKE PAAJARVI, SOUTHERN FINLAND, AND THE ECOLOGI-CAL STUDIES ON IT, Helsinki Univ. (Finland). Dept. of Botany.

R. Ruuhijarvi.

Annales Botanici Fennici, Vol 11, No 2, p 95-104, 1974. 4 fig, 4 tab, 39 ref.

Descriptors: *Lakes, *Europc, *Oligotrophy, *Humus, Trophic level, Hydrography, Lake morphometry, Geomorphology, Climatic data, Vegetation, Land use, Water chemistry, Forests, Aquatic plants Identifiers: *Lake Paajarvi(Finland).

Lake Paajarvi, a mesohumic, oligotrophic lake in southern Finland, has a maximum depth of 90 meters. Mineral bottoms predominate. It has two systems of shear zones and is located between two terminal-moraine systems of glacial origin. Ice covers the lake about 140 days a year. Its thermal structure is dimictic. The drainage basin lies in the southern boreal vegetation zone and consists of half coniferous forests plus cultivated land, peat-lands, lakes, and deciduous forests. Agricultural runoff and sewage are causing eutrophication. Only algae are present in the littoral-profundal zone. Floating-leaved plants cover 0.37% and submerged plants 10.9% of the lake. Isotherms show a long spring overturn, a stagnation period, and an autumnal drop in water temperature. Wind influences thermal stratification. Water level varies about 70 cm. Inflow of organic matter follows variations in stream discharge. Water chemistry measurements do not vary with season or stations. Inorganic carbon is higher and pH and oxygen saturation values are lower in the hypolimnion than epilimnion. Electrolytic conductivity and total phosphorus, potassium, and sodium contents are low, but nitrogen high. Lake Paajarvi is a rela-tively typical Finnish lake in its chemical properties. (Buchanan-Davidson--Wisconsin) W75-11229

AN INVESTIGATION OF GLYCOLATE EXCRETION IN TWO SPECIES OF BLUE-GREEN ALGAE.

York Univ., Downsview (Ontario). Dept. of Biolo-

R. H. Cheng, A. G. Miller, and B. Colman. Planta (Berl.), Vol 103, p 110-116, 1972. 1 fig. 3 tab 21 ref

Descriptors: *Cyanophyta, *Anabaena,
*Biochemistry, *Alcohols, Photosynthesis,
Cytological studies, Carbon dioxide, Carbon cycle, Organic compounds.

Identifiers: *Glycolic acid, *Excretion, Glycolate.

The excretion of organic compounds by two species of filamentous blue-green algae during short periods of photosynthesis was studied by allowing the algae to assimilate radioactive bicarbonate. The amount of C14 glycolate excreted by Oscillatoria and Anabaena flos-aquae was less than 1% of the C14 fixed by the algae during photosynthesis. Transfer of cells grown on 5% carbon dioxide in air to a medium of low bicarbonate concentration or treatment of the cells with isonicotinvl hydrazide during photosynthesis caused little increase in glycolate excretion. Alpha-hydroxysulfonates failed to simulate massive excretion of glycolate. Although these blue-green algae excreted little glycolate, a significant proportion of the photosynthetically fixed carbon was excreted in the form of basic, neutral, and acidic compounds, and such excretion was greater in 5% carbon dioxide-grown cells than in air-grown cells. Amino acids made up the majority of labeled compounds excreted. The acid fraction consisted of residual bicarbonate, an unknown compound eluted with acetate, and glycolate. The usual pathway of glycolate utilization through glycine and serine did not appear to be very active in these algae. (Buchanan-Davidson--Wisconsin) W75-11230

INFLUENCE OF OIL ON NUCLEIC ACIDS OF ALGAE.

Institute of Biology of The Southern Seas, Sevastopol (USSR).

A. Davavin, O. G. Mironov, and I. M. Tsimbal. Marine Pollution Bulletin, Vol 6, No 1, p 13-15, 1973. 6 tab. 10 ref.

Descriptors: *Marine algae. *Plant physiology. *Biochemistry, *Oil pollution, Water pollution effects, Rhodophyta, Inhibitors, Organic acids, Oceans, Oil wastes, Organic compounds. Identifiers: *Nucleic acids, Ribonucleic acid, Deoxyribonucleic acid, Ulva lactuca, Grateloupia dichotoma, Polysiphonia opaca.

The marine algae, Ulva lactuca, Grateloupia dichotoma, and Polysiphonia opaca, were exposed to Romashkinskaya oil and C14 labeled sodium carbonate. Deoxyribonucleic acid (DNA) carbonate. Deoxyribonucleic acid separated from Ulva showed no substantial difseparated from Ova showed no substantial dif-ferences in degree of polymerization between sta-ble and labile DNA. Activity increases in low polymer fragments indicated DNA depolymeriza-

tion. Stable DNA was more resistant to oil and labile DNA more sensitive, possibly causing destruction of the mechanism of expression of heredity, synthesis of anomalous proteins, and death. Ulva DNA and RNA specific activities depended on length of exposure and oil concentration; increasing oil concentrations caused decreased specific activity. Complete inhibition of nucleic acid biosynthesis at high concentrations of oil occurred after 48-72 hours. With all algae there simultaneous inhibition of DNA and RNA, but there were variations due to differences in their systemic positions and individual peculiarities. Oil pollution decreased RNA and DNA contents of red algae by inhibition of biosynthesis. It is concluded that the influence of oil on algae was due to modification of the degree of polymerization and inhibition of DNA and RNA biosynthesis, thus reducing the nucleic acid con-tent. (Buchanan-Davidson--Wisconsin) W75-11232

MAN'S IMPACT ON A NEWLY FORMED RESERVOIR,

New Mexico Univ., Albuquerque. Dept. of Biolo-

E. W. Hansmann, D. E. Kidd, and E. Gilbert. Hydrobiologia, Vol 45, No 2-3, p 185-197, 1974. 6 fig, 5 tab, 9 ref. NSF GI-29422.

*Reservoirs, *Eutrophication, *Recreation, *Colorado River, *Productivity, Arizona, Utah, Climatic data, Geomorphology, Seasonal, Annual. Identifiers: *Lake Powell(Ariz-Utah).

The impact of recreation on eutrophication was studied in the Lake Powell Reservoir which resulted from the Glen Canyon Dam built on the Colorado River at the Arizona-Utah border. Water quality was determined by measuring primary net productivity using C12. Recreational activities in the Wahweap area had a stimulating effect on net productivity and eutrophication of the area compared to other sites, especially during the summer season. Higher production at the Navajo site during the winter season did not appear to be related to recreational activities thus must be assumed to be due to natural unknown abiotic conditions. Lake Powell can be classified as a naturally eutrophic body of water with a mean production rate at its lower end of 645.7 mg/C12/sq m/day. It is not known if the complete Lake Powell system is naturally eutrophic or only the area under study The results are undoubtedly an underestimation of the total carbon production of the area. Benthic primary communities have been observed in several bays and canyons and must be accounted for in analyzing the results. (Buchanan-Davidson--Wisconsin) W75-11233

EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. IV. FEEDING OF INTRODUCED AND AUTOCHTHONOUS NON-PREDATORY FISH,

Warsaw Univ. (Poland). Dept. of Hydrobiology. A. Prejs.

Ekologia Polska, Vol 21, No 31, p 465-503, 1973. 8 fig, 12 tab, 81 ref.

Descriptors: *Fish management, *Fish stocking, *Fish diets, Fish food organisms, Carp, Fish populations, Spatial distribution, Competition, Herbivores, Feeding rates, Benthic fauna, Zooplankton, Aquatic plants, Europe. Identifiers: *Lake Warniak(Poland), Bream,

Roach, Tench.

Introduction of carp and bream into a shallow, eutrophic lake, the effect of the considerably increased and changed fish stock on the biocenosis of the water body, and the practical aspects of fishery management were studied. Studies on the feeding of non-predatory fish dealt with food com-position of introduced fish and of dominant autochthonous non-predatory species; feeding intensity of examined species; analysis of food relations in the changed community of non-predatory fish due to introduction of new species. Carp. bream and tench feed mainly on bottom fauna and fauna associated with plants; crucian carp feed on zooplankton, and roach prefer plant food, with macrophytes the first choice. In the years of studies, together with the increase of fish stock their grazing intensity decreased and their feeding habits changed. In the year with the most numerous fish stock the introduced species (carp and bream) ate about 60% of the bottom fauna biomass and fauna associated with plants; about 30% of zooplankton biomass was consumed by the whole community of non-predatory fish. Data on the differentiation of the distribution of basic feeding grounds of particular fish species are presented. (Jones-Wisconsin)

CONTRIBUTION TO THE BIOLOGY OF NITELLA HOOKERI A. BR. IN THE ROTORUA ZEALAND. II. NEW NUTRIENTS AND PHYSICAL FACTORS,

Auckland Univ. (New Zealand). Dept. of Botany. M. B. Starling, V. J. Chapman, and J. M. A.

Hydrobiologia, Vol 45, No 2-3, p 157-168, 1974. 5 fig, 2 tab, 21 ref.

Descriptors: *Algae, *Chara, *Nutrient requirements, *Growth rates, Cultures, Vitamins, Weight, Water temperature, Light intensity. Identifiers: *Nitella hookeri, *Rotorua Lakes(New Zealand), Thiamine, Pyridoxin, Nicotinamide, Cobalamin, Riboflavin, Biotin, Ascorbic acid, Giberellic acid, Kinetin, Indole acetic acid.

Growth of Nitella hookeri A. Br. in non-axenic cultures, with or without soil extract, is not significantly stimulated by addition of most vitamins, coenzymes, and growth hormones. Thiamine, pyridoxin, and nicotinamide increased growth slightly but only at concentrations greater than those found under field conditions. Kinetin inhibited growth. Nitella propagules are not typical adult vegetative cells in their responses but form naturally in the lakes so may indicate possible factors governing growth for certain periods of the year. The best growth measured by linear incre-ment, dry weight, and fresh weight was at 17C; growth ceased at 10C or 25C. Growth increased with increased light intensities, but 600 lux for a 12-hour day appeared to be the best long term condition. However growth responses to varying tem-perature and light conditions were confused thus a more rigid growth assessment is needed. The same general trends were observed in these experiments as were observed under natural conditions in the New Zealand Rotorua Lakes and help explain the natural distribution of Nitella in these lakes. However winter growth occurs at a temperature of about 10C in these lakes, indicating that laboratory culture conditions have not defined all growth factors. (Buchanan-Davidson--Wisconsin)

SEASONAL ABUNDANCE OF CRUSTACEAN ZOOPLANKTON AND NET PLANKTON BIOMASS OF LAKES HURON, ERIE, AND ON-TARIO.

Canada Centre for Inland Waters, Burlington (Ontario)

Ontano). N. H. F. Watson, and G. F. Carpenter. Journal of the Fisheries Research Board of Canada, Vol 31, No 3, p 309-317, 1974. 2 fig, 5 tab,

Descriptors: *Seasonal, *Zooplankton, *Plankton, *Biomass, *Lake Erie, *Lake Huron, *Lake On-Summer, Autumn, Cladocera, Copepods, Phytoplankton, Dominant organisms, Grustaceans, Shallow water, Littoral, Varieties, Great Lakes, Daphnia.

Group 5C-Effects Of Pollution

Crustacean zooplankton and net plankton biomass changed from April to December in Lakes Huron, Erie, and Ontario. Species were generally identical but times of maxima and relative species composition differed. Net biomass changes were due to changes in species composition, total crustacean numbers and phytoplankton quantities. Numbers were lower in the main part of Lake Huron than Lake Ontario, but net biomass values were equal or greater than those in Lake Ontario open waters because the organisms were larger and net phytoplankton amounts differed. Crustacean concentrations and biomass were highest in inshore water in all lakes, but fluctuated more than in offshore areas, especially in Lake Huron. Fluctuations in crustacean numbers were related to seasonal cycles of cladocerans and cyclopoid which often had summer maxima. Calanoids had more stable numbers. Biomass fluctuations were related to phytoplankton blooms. Calanoid copepods were most abundant and diverse in Lakes Huron and western Lake Erie, and cyclopoids and cladocerans in Lake Erie, and cyclops poids and cladocerans in Lake Erie, Ontario, and Saginaw Bay of Lake Huron. Diacyclops bicuspidatus thomasi was the most abundant cyclopoid all year in all lakes, Tropocyclops prasinus in Lake Ontario, and Acanthocyclops vernalis in Lake Erie. Cladocerans were most numerous in Lakes Erie and Ontario. (Buchanan-Davidson--Wisconsin) W75-11238

EFFECTS OF OZONE-TREATED SEAWATER ON THE SPAWNED, FERTILIZED, MEIOTIC, AND CLEAVING EGGS OF THE COMMER-CIAL AMERICAN OYSTER,

S. A. Maclean, A. C. Longwell, and W. J. Blogoslawski

Mutat Res, Vol 21, No 5, p 283-285, 1973.

Descriptors: Water pollution effects, *Oysters, Sea water, *Spawning, *Fertilization, Commercial shellfish, *Fish eggs.

Identifiers: *American oyster eggs, Crassostrea-virginica, Parthenogenesis, Protoplasm, Meiotic eggs(Oysters).

Fertilization of Crassostrea virginica eggs oc-curred less readily in O3 treated water, as evidenced by a decrease in polyspermy and an in-crease in parthenogenesis. Larger numbers of eggs retarded in their completion of meiosis were noted and there was an increased incidence of abnormal polar bodies in the ozonized water. Most prominent in the O3-treated water were the large numbers of cleaving eggs with abnormal nuclei. The decomposition of ozone in water produces the same positive radicals (OH and HO2) generally considered the biologically active products of ir radiation of protoplasm and the cytological and cytogenetic effects of ozone appear radiomimetic.—Copyright 1974, Biological Abstracts. Inc.

ACUTE TOXICITY OF PETROCHEMICAL DRILLING FLUIDS COMPONENTS AND WASTES TO FISH,

Fisheries and Marine Service, (Manitoba). Resource Management Branch.
M. R. Falk, and M. J. Lawrence.
Technical Report Series No CEN-T-73-1, April,

1973, 108 p. 9 fig, 10 tab, 7 ref.

Descriptors: *Toxicity, *Drilling fluids, *Rainbow Descriptors: Toxicity, Dinning Itulias, Kainoow trout, Fish, Lethal limit, Pollutants, Water pollu-tion effects, Oil fields, Oil wells, Water wells, Mud, Slurries, Wells, Bentorite, Bicarbonate, Potassium compounds, Waste disposal, Sumps, Drainage, Surface water.

Identifiers: *Lake chub(Fish), *Lignosulfate, *Barium sulfate, Waste containment.

A study conducted in 1972 consisted of a field pro gram to acquire information on the nature and amounts of drilling fluid compounds used, the effi-

ciency of waste containment facilities and on toxicities of drilling and sumps fluids, and a laboratory phase to determine acute toxicities of drilling fluids and their constituent chemicals. Drilling fluids were acutely toxic to lake chub and rainbow trout with 96 hour LC50's of 0.83 to 12.0 percent. Sump fluids were less toxic with one sump vielding 96 hour LC50's of 22.5 and 81.0 percent for composite and surface sump fluids, respectively. Out of 27 common components of drilling fluids, seven were toxic and six were moderately toxic. The field program was conducted in the Mackenzie delta area, Northwest Territories, Canada. Recommendations on waste containment, treatment and future studies are given. A brief description of the nature and function of drilling fluids and their constituent chemicals is also included. (Bradbeer-NWWA) W75-11265

THE TOXICITY OF DRILLING FLUID COM-PONENTS TO AQUATIC BIOS BIOLOGICAL

Service, **Fisheries** and Marine (Manitoba).

Technical Report No 487, 1974. 33 p, 8 tab, 58 ref.

Publications, *Bibliographies, *Data collections, *Toxicity, *Fish, *Drilling fluid, Marine biology, Aquatic animals, Suspended solids, Suspended load, Environment, Pollution, *Water pollution effects, Surface waters. Identifiers: Barite, Lignosulphate.

A literature review is presented on the toxicity to aquatic biological systems of drilling fluid components in northern Canada. This review includes aquatic toxicity literature that was available prior to January 31, 1974. The components of drilling fluids include suspended solids, chlorides, alkaline sources, chromium compounds, bactericides, organic polymers, dispersants, defoamers, lubri-cants and detergents. On the basis of quantities used and of the harmful long-term effects produced, the alkaline sources, bactericides, barisium chloride compromise the major sources of aquatic toxicity. (Bradbeer-NWWA) W75-11266

FERTILIZER PHOSPHATE IN STREAMS AND LAKES, Canberra Coll. of Advanced Education

(Australia). For primary bibliographic entry see Field 5B.

NATURAL AND FERTILIZER NITROGEN IN

STREAMS AND LAKES, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Use Research For primary bibliographic entry see Field 5B. W75-11311

SEASONAL ABUNDANCE AND DIVERSITY OF BENTHOS IN A SOUTHERN ILLINOIS, USA SWAMP

Central Michigan Univ., Mt. Pleasant. Dept. of Biology.

For primary bibliographic entry see Field 2H. W75-11312

GUIDELINES FOR THE IDENTIFICATION OF POTENTIAL ENVIRONMENTAL IMPACTS IN THE CONSTRUCTION AND OPERATION OF A RESERVOIR,

Illinois Univ., Urbana. Dept. of Forestry. F. L. Johnson, and D. T. Bell. Research Report No. 75-6, June 1975. 36 p, 2 fig,

Descriptors: *Reservoir construction, *Reservoir operation, *Environmental effects, Air pollution effects, Microclimatology, Soil properties, Ecology, Wildlife, Vegetation, Groundwater, Surface waters, Water quality, Land forming, Recreation, Natural resources, Aesthetics, Reservoirs, Con-struction, Operations.

A

sy an th de w po

This guide summarizes how the construction and operation of a reservoir will affect the attributes of the biophysical environment. The latter inclu air quality, microclimate, soil conditions, ecological relationships, fauna, flora, groundwater hydrology, surface water, land forms and processes, outdoor recreation, preservation of natural resources, special interest areas and sites, aesthetics, and surface water quality. Construction operations and associated activities are outlined and described. (Witt-IPC)

EFFLUENT CHARACTERISTICS AND TREAT-MENT OF MECHANICAL PULPING EF-FLUENTS,

B.C. Research, Vancouver(British Columbia). For primary bibliographic entry see Field 5D.

5D. Waste Treatment Processes

PHYTOPHTHORA SPECIES IN ARIZONA: ITS OCCURRENCE IN RECYCLED IRRIGATION WATER.

California Univ., Berkeley. Dept. of Plant Patholo-

For primary bibliographic entry see Field 5A. W75-10883

ORGANIC COLOR IN GROUNDWATER OF

MISSISSIPPI, Mississippi State Univ., Mississippi State. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W75-10907

REVIEW OF CONFERENCE ON HYDROLOGY OF DEEP SEDIMENTARY BASINS. Tulsa Univ., Okla. Dept. of Earth Science For primary bibliographic entry see Field 5B. W75-10935

AN APPRAISAL OF POTENTIAL WATER SALVAGE IN THE LAKE MCMILLEN DELTA AREA, EDDY COUNTY, NEW MEXICO, Geological Survey, Reston, Va. For primary bibliographic entry see Field 3B. W75-10941

PILOT-PLANT STUDY OF DENITRIFICATION USING A SUBMERGED SAND FILTER AT RYE MEADS SEWAGE WORKS.

Water Pollution Control, Vol 73, No 6, p 685-692, 1974. 6 fig, 3 tab, 19 ref.

Descriptors: *Waste water treatment. *Filters. *Nitrates, *Sewage treatment, Effluents, Pilot plants, Runoff, *Denitrification, Anaerobic treatment, Filtration.

Identifiers: Auto analyzer, Rye Meads(Gt Brit), Submerged sand filter.

The reduction of nitrate from all sources in the River Lee at Chingford, Great Britain was investigated. Major sources of nitrate are sewage effluent, drainage and surface runoff from agricul-tural land. Of the possible methods of nitrate reduction, removal from effluent by the addition of a methanol carbon source and an anaerobic flooded sand filter was chosen. A pilot plant study at the Rye Meads Sewage Works used a Sub-

Waste Treatment Processes—Group 5D

merged sand filter for sewage effluent treatment. Analysis of amm. N, chloride, phosphate, anionic synthetic detergents and nitrate were made using an Auto Analyzer. No significant differences in these between the work's effluent or the denitrified effluent were found. Suspended solids were reduced from 10 mg/liter to 5 mg/liter by passage through the sand filter. The COD values obtained were used as an indication of residual methanol. The methanol requirement is dependent upon nitrate concentration and continuous moni-toring of nirtate would be necessary for a large plant. During seven months of testing the dentrification unit, it was shown that 96 percent of nitrate-N was removed from approximately 8000 liters per day of effluent with a contact period of seven minutes and 100 mg/liter of methanol added as a carbon source. The Rye Meads Works is amenable to denitrification using this process. rapid-gravity sand filter, enabling up to 4540 cu m effluent per day to be denitrified. (Prague-FIRL) W75-10955 Further plans include modification of the existing

WATER AND WASTEWATER DISINFECTION WITH OZONE: A CRITICAL REVIEW, Cincinnati Univ., Ohio.

CRC Critical Reviews in Environmental Control, p 141-152, January, 1975. 2 fig, 3 tab, 17 ref.

Descriptors: *Ozone, *Waste water treatment, *Water treatment, Chlorine, Costs, Biochemical *Water treatment, Chiorine, Coste, Monard oxygen demand, Municipal water, Potable water, Toxicity, Environmental effects, Design criteria, Treatment facilities, Monitoring, *Reviews, *Disinfection

Technical literature on ozone disinfection, as an alternative to chlorine, is reviewed. General statements made include: ozone is a powerful bactericide and a powerful virucide in water or waste water; most waters and waste waters require a higher amount of ozone than chlorine on a mg/liter basis to accomplish the same disinfection; costs of disinfection with chlorine are lower than those ozone. Also, ozone will probably not be widely used in the United States for municipal water disinfection unless the requirement in most states for residual disinfectants in the water after a specific contact time is changed, and unless cost is not considered as the major design consideration. Ozone disinfection may be implemented as a unit process in waste water reclamation plants for potable reuse application. Additional research on ozone as a disinfectant was suggested in the areas of: disinfection efficiency against organisms not yet stu-died; new contacting schemes to reduce capital costs and increase mass transfer; ozone measuring and monitoring systems; ozone production equip-ment; toxicity of ozonation products in disinfected water; physiological effects of low concentrations of ozone to man; and, BOD5, COD, and TOC relationships in ozone disinfection. (Prague-FIRL) W75-10956

POPULATION DYNAMICS OF PROTOZOA IN

WASTEWATER, Howard Univ., Washington, D.C. Bioenvironmen-M. Warma, H. E. Finley, and G. H. Bennett. Journal Water Pollution Control Federation, Vol 47, No 1, p 85-92, January, 1975. 5 fig, 2 tab, 20

Descriptors: *Waste water treatment, *Bacteria, *Biological treatment, *Protozoa, Digestion, Laboratory investigations, Microorganisms, Clarification, Municipal wastes, *District of Columbia, Pollutant identification.

Identifiers: Opercularia, Vorticella, Protozoa population dynamics, Blue Plains Treatment Plant, Washington, DC.

A study was conducted to identify the dominant protozoa in the various parts of the waste water

treatment processes of the Blue Plains Treatment Plant, Washington, D.C. Its second objective was to observe the dominant protozoa in the secondary effluent, within laboratory conditions simulating the plant, in order to determine whether or not the populations are influenced by environmental factors. Finally, the laboratory equipment simulating plant conditions was seeded with two peritrichs. Vorticella and Opercularia, and the common bacteria from the plant effluent; buffers and organic nutrients, sucrose and glutanic acid, were then added to determine whether these additives affected the growth of the protozoan populations. From the investigations, the relative importances of bacteria and protozoa was waste water treatment were examined. It was concluded that Vorticella, which is responsible for clarification, is dominant in secondary effluent. The death rate of Opercularia was not significantly affected by pH changes, while the Vorticella population was more sensitive to such changes. Also, when glutamic acid was added, the Opercularia population increases in number. These findings indicate that further tests should be made to determine the optimum protozoa:microorganism ratio at various substrate concentrations existing in a treatment plant. Tests are necessary to compare catalase activity with the ratio and also to determine whether the bacteria are dead or alive when they are digested by protozoa. (Prague-FIRL) W75-10957

THE MECHANISM OF FLOCCULATION PROCESSES IN THE PRESENCE OF HUMIC THE

STUBTANCES, Technion - Israel Inst. of Tech., Haifa.

N. Narkis, and M. Rebhun.

Journal of the American Water Works Associa-Vol 67, No 2, p 101-108, February, 1975. 8

Descriptors: *Organic compounds, *Flocculation, Waste water treatment, Polyelectrolytes, Cations, Anions, Suspended solids, Biological treatment, Fulvic acids, Humic acids, Colloids, Oranic acids.

Identifiers: Organo-clay complexes.

The mechanism of flocculation is detailed for a system with organic matter, particularly with clay suspensions interacting with humic and fulvic acids. A radioactively labelled cationic polyelectrolyte was used to facilitate this study. The phenomenon of flocculation is similar in any system where suspended colidic interacts with dissystem where suspended solids interact with dis solved organic matter, such as in raw sewage or effluents from biological treatment plants. It was demonstrated that the salts of humic and fulvic demonstrated that the saits of numic and ruivic acids, which are anionic polyelectrolytes, react chemically with the polycationic flocculant through carboxylate and phenolate groups and thus form colloidal-reaction-product flocculates which are removed by settling. In this case, a ca-tionic polyelectrolyte was added to an organo-clay complex suspension dispersed in humate or ful-vate solution. The polyelectrolyte was shown to react first with free humates and fulvates and only after the complete reaction with free organic acids did flocculation of the suspension occur. Because the presence of organic matter in solution or as a complex on the mineral clay particle surface inhibits the process of flocculation, large doses of the flocculant are necessary to produce reaction conditions favorable for complete reaction.
(Prague-FIRL)
W75-10958

OZONE TREATMENT LICKS PROBLEM. COLOR

Water and Sewage Works, Vol 122, No 4, p 52-54, April, 1975. 3 fig.

Descriptors: *Waste water treatment, *Water supply, *Ozone, *Chlorination, *Treatment facilities, Color, Odors, Filtration.
Identifiers: *Color removal, Watchgate Treatment Works(Gt Brit), Ozonization

The scheme of water supply treatment for the city of Manchester, England, and the Watchgate Treatment Works is described. The Works consists of Five units--control, filter, washwater, contact tank, and ozone. Basic treatment involves rapid gravity filtration, super-chlorination and contact, pH correction, and chlorine residual control of the finished waters. A basic problem in the system was color reduction, associated with removal of particulate matter and sterilization. Water from Windermere and Haweswater, two of four sources, had color up to 7 degrees and 30 degrees Hazen respectively. Required characteristics of the treated water are pH 7.5 to 8.0, color less than 5 degrees Hazen, and turbidity less than 2 ppm. To remove color from the Haweswater water, pretreatment by filtration and chlorination is followed by ozonization in three separate streams. The use of ozone is particularly suited to the limited head available throughout the plant. Ozone may also be used to sterilize Haweswater water if chlorine is not available, and to control tastes and odors when required. A plan of the Watchgate Treatment Works is detailed, whereby the ozone unit may be utilized or by-passed. The layout includes administrative offices, Laboratories, a control room, an equipment room, and chemical storage facilities; the site provides for alternative treatment methods. (Prague-FIRL) W75-10959

FIRST STAGE OF THE WORLD'S LARGEST PURE OXYGEN SEWAGE PLANT TO UN-

Engineering News-Record, Vol 194, No 2, p 16-17, January 9, 1975.

Descriptors: *Oxygen, *Aeration, *Sewage treatment, Pilot plants, Municipal wastes, Treatment facilities, *Waste water treatment, Michigan, Ox-

ygen. Identifiers: *Detroit(Mich), Hydrocarbons.

The Detroit Metro Water Department, of Detroit. Michigan, has built a 300-mgd pure oxygen treat-ment system for municipal wastes. A 600-mgd capacity additional facility is under construction for 1977, which will make the system the world's largest pure oxygen plant. The system was chosen on the basis of space considerations, successes with pure oxygen aeration elsewhere, and tests with a 100,000 gpd pilot plant. The new system has been tested to be capable of reducing BOD and suspended solids in effluent to 20 ppm, which is below the design goal of 30 ppm. Two identical aeration tanks were built five years ago at the projects inception, one with oxygen and one with air equipment. In July, a comparison will be made, and it is hoped that the air system will be converted to oxygen. The new installation needs only 48% of the air system's power because the partial pressure of oxygen in air is 160 mm of mercury, whereas the partial pressure of pure oxygen is 760 mm. Thus, a pure oxygen system has almost five times the internal driving force of an air system, requiring less pumps, condensers, and mixers. The system, including the Detroit plant's high-capacity final clarifiers should cut operating and capital costs by \$21 per million gallon each year. Because the Detroit plant is landlocked, the sewage plant has installed deep tanks to conserve space. Other design considerations include air sampling for automatic shutdown should volatile hydrocarbons in sewage, reach 20% of their explosive limit. Further tests will demonstrate the systems operation in cold weather. (Prague-FIRL) W75-10960

SOME STUDIES ON NITRIFICATION IN THE ACTIVATED SLUDGE PROCESS, Sheffield Water Pollution Control Dept.

(England). I. R. Hall

Water Pollution Control, Vol 73, No 45, p 538-547, 1974. 4 fig, 2 tab, 22 ref.

Group 5D—Waste Treatment Processes

*Waste Descriptors: water treatment. *Nitrification, *Sewage treatment, Ammonia, Industrial wastes, Toxicity, Activated sludge, Hydrogen ion concentration.

Identifiers: Ammonia removal, Nitrosomonas.

Nitrification in the activated sludge plant for removing ammonia at Sheffield's Blackburn Meadows sewage works was investigated. This sewage contains about 25 percent industrial waste sewage contains adout 25 percent industrial wastes. It was thought that nitrification would be the most economical method of removing ammonia. Results of experimental testing showed that sewage from this plant can be consistently nitrified using the activated sludge method. The rates of growth of Nitrosomonas in activated sludges grown on an industrial and domestic sewage, when ammonia was not rate-limiting, were higher than those reported elsewhere for low temperature domestic sewage. The pH value for nitrification was always above 6.3 and nitrifying activity of activated sludges was independent of pH value in the range of 7 to 9 Discussed also was a simplified method to predict whether nitrification will occur, from consideration of either sludge loading or sludge wastage. In addition, it was suggested that new discharges to sewers be screened for potential toxic hazards. (Prague-FIRL) W75-10961

PRESERVING ACTIVATED SLUDGE.

Wiggins-Rimer and Associates, Durham, N.C. J. A. Nissen, and P. A. Vesilind. Water and Sewage Works, Vol 121, No 8, p 48-52, August, 1974. 7 fig, 5 ref.

Descriptors: *Waste water treatment, *Activated Studge, *Preservation, Analysis, Analytical techniques, Testing, Biodegradation, Sludge digestion, Microbial degradation. Identifiers: *Formaldehyde.

Many problems result when the sludge from pilot or bench-scale experiments is transported to consultants, equipment manufactures, or commercial laboratories for analysis. A cheap, readily available method of preserving waste water sludges is needed that is capable of stopping all biological action, without changing the physical characteristics of aerobic or anaerobic sludge. The preservative agent should possess the following attributes: be able to kill the types of organisms found in biological sludge before biological action can alter the physical characteristics of the sludge; the physical structure of the cells killed should not be changed by the action of the preservative; the required dosage should not be large enough to significantly dilute the sample; the preservative should not be hazardous to humans; and, the preservative should be economical and readily available. As a result of the experiments performed, formaldehyde is considered an acceptable preservative for activated and digested sludge. Dosages suffi-cient to effectively kill activated sludge organisms are in the range of 0.5-1.0 percent commercial grade formaldehyde (by volume). Activated sludge which undergoes anaerobiasis and becomes anaerobic demonstrates much better settling characteristics and a lower viscosity than the fresh or preserved sludge. Digested sludge organisms were found to be sensitive to very small dosages of formaldehyde. Small dosages of formaldehyde do not significantly change the physical nature of digested sludge or interfere with the action of chemical conditioners. (Orr-FIKL) W75-10962

DISINFECTING WITH WASTEWATER CHLORINATION/DECHLORINATION PART 1, G. C. White.

Water and Sewage Works, Vol 121, No 8, p 70-71, August, 1974. 1 fig.

Descriptors: *Waste water treatment. *Chlorination, *Coliforms, *Disinfection, Chemical reactions, Mathematical models, Biochemical oxygen demand, Suspended solids, Chemistry, Potable water, Water treatment, Sewage treatment.

The disinfection of waste water is an important in waste water treatment as BOD, suspended solids, and grease removal. The chemistry of waste water chlorination is described. When a chlorine solution from a conventional gas chlorinator enters the waste water stream the reaction that takes precedence over all others is the reaction between free chlorine and ammonia nitrogen to form chloramine and water. This reaction is 99% complete in a fraction of a second at 60-65F and pH 7.5. The mechanism of disinfection is generally accepted to be penetration through the cell wall of the microorganism by the chlorine compound and a chemical reaction between the compound and the vital parts of the microorganism so that reproduction is ended. When potable water is chlorinated that contains only an excess of am monia nitrogen, the resulting compounds are almost all monochloramines. However, if organic nitrogen is present in amounts greater than 0.15 mg/liter, dichloramine begins to form. This compound or similar compounds have a poisoning effect on chlorine residuals that are only a few minutes old and for this reason back-mixing or short circuiting in a chlorine contact chamber should be avoided. The mathematics of the most probable number (MPN) of coliform concentration from a quantitative viewpoint is presented. The following equation was developed from a pilot plant system that had excellent mixing: y=y sub o (1 + 0.23 ct) where y=MPN in chlorinated waste water at end of time t; y sub o=MPN in effluent prior to chlorination; c=total chlorine residual in mg/liter; and, t=contact time in minutes. This mathematical model illustrates the importance of waste water quality on the attainment of a low coliform concentration. (See also W75-10964) (Orr-FIRL) W75-10963

DISINFECTING WASTEWATER CHLORINATION/DECHLORINATION PART 2, G. C. White.

Water and Sewage Works, Vol 121, No 9, p 93-95, September, 1974. 1 fig.

Descriptors: *Chlorination, *Disinfection, Equipment, *Wastewater treatment, *Potable water, Control, Water purification, Water treatment, Sewage treatment, Water quality control.

The three major factors that account for the difference in the sensitivity between potable water and waste water to the disinfection process by chlorine are the magnitude of coliform concentration prior to chlorination, the ammonia nitrogen content, and the relatively high organic nitrogen content in waste water effluents. The most efficient chlorination disinfection systems studied had four attributes in common: very good initial mixing; sufficient contact time (at least 30 min. at peak flow) in an outfall conduit or a well designed basin; a good automatic chlorine residual control system; and, competent operating personnel. Mixing should ideally be completed in a fraction of a second. In actual operation, mixing completed within one to three seconds is considered excellent. A tubular type of reactor or a closed conduit are both good mixing devices. A chlorine contact chamber should provide sufficient residence time for the chlorine to reduce the harmful and objectionable microorganisms to acceptable levels Closed conduits are the best contact chambers followed by long narrow outfall channels as the second best type. There are two types of chlorine residual control systems: straight residual control where the analyzer controls both the change in flow rate and chlorine demand of the waste w measuring device and from a residual analyzer. The compound loop system is recommended because of its ability to cope with sudden changes in flow. (See also W75-10963) (Orr-FIRL) W75-10964

NITROGEN REMOVAL BY CATALYST-AIDED BREAKPOINT CHLORINATION,

Environmental Quality Research and Develop-ment Unit. New York State Dept. of Environmental Conservation, Albany. W. N. Stasiuk, L. J. Hetling, and W. W. Shuster.

Journal Water Pollution Control Federation, Vol. 46, No 8, p 1974-1983, 1974. 7 fig, 2 tab, 10 ref.

Descriptors: Nitrogen, *Ammonia, *Algae, *Chlorination, *Waste water treatment, Water pollution, Nitrification, Denitrification, Ion exchange, Oxidation, Activated carbon, Nitrogen compounds, Nutrient removal, Adsorption. Identifiers: Chloramine formation, *Breakpoint chlorination, Air stripping, Nitrogenous oxygen demand, Trichloramine, Monochloramine, Dichloramine, *Nitrogen removal.

Under certain conditions, the removal or conversion of nitrogenous species in waste waters is necessary. Ammonia must be removed to a form with no direct oxygen demand when ammonia nitrogen exerts a large drain on the oxygen resources of the receiving waters. When the nutrient that limits algae growth is nitrogen, removal is needed to eliminate nuisance algal blooms. Methods developed for the conversion, reduction, or removal of ammonia nitrogen in waste waters include biological nitrification-denitrification, selective ion exchange, air stripping at elevated pH, and breakpoint chlorination. A technique for reducing nitrogenous oxygen demand submitted to the New York State Department of Environmental Conservation utilized adsorption of chloramines on activated carbon. Chloramines are formed in chlorinated waters containing ammonia and hypochlorous acid. Previous chloramine formation studies were handicapped by the occurrence of decomposition reactions at low, pH, as well as Cl:N ratios greater than 5. These consisted of the loss of oxidizing chlorine and ammonia nitrogen, and are called breakpoint chlorination reactions. An advantage would be realized if monochloramine were adsorbed on activated carbon. The theoretical Cl:N ratio for 100 per cent removal of ammonia would decrease from 76:1 for breakpoint to approximately 5:1 for the formation of monochloramine to be adsorbed on the carbon. (Leibowitz-FIRL) W75-10965

DEWATERS SLUDGE.

Water and Wastes Engineering, Vol 11, No 8, p 45, August, 1974. 1 fig.

Descriptors: *Sludge, *Dewatering, Water pollu-tion control, *Centrifugation, Industrial wastes, Municipal wastes, Commercial wastes, *Waste water treatment, Alum, Activated sludge, Equipment.

Identifiers: Sludg-a-Tron.

A centrifuge called the Sludg-a-Tron is being utilized in pollution control and processing services for dewatering and concentrating a wide range of industrial, municipal, institutional and commercial sludge wastes. The centrifuge is able to concentrate sludges from one percent, solids up to 35 percent solids by weight and higher, treating aerobi-cally digested sludges, biological sludges, waste activated sludges, water treatment alum sludges, and other industrial wastes. The Sludg-a-Tron is expected to be broadly utilized in waste treatment facilities on two-stage dewatering systems. A high solids capture rate, with efficiencies ranging up to 99 percent, is achievable without the use of polyelectrolytes or flocculants. The centrifuge can achieve a uniformity of cake, and a high degree of cake compaction, without regard to feed rate or composition. Some advantages listed are maximum installation space, low operating speed, minimum power requirements, design simplicity, choice of driving arrangements, and a large range of options and accessories. (Leibowitz-FIRL) W75-10966

Waste Treatment Processes—Group 5D

WASTEWATER TREATMENT USING ALGAE

AND ARTEMIA,
Illinois State Univ., Normal. Coll. of Applied Science and Technology.

A. R. Jacobson. Public Works, Vol 105, No 10, p 114, October,

Descriptors: *Eutrophication, *Organic wastes, *Algae, *Artemia, *Waste water treatment, *Sewage treatment, Aeration, Tertiary treatment, Identifiers: Raw wastes, Mariculture.

A new system of controlled eutrophication for either waste water or high organic wastes was in-vestigated. Laboratory studies used Chlorella and Tetraselmis algae in conjunction with Artemia salina (brine shrimp) to provide controlled purification of raw and treated waste. Artemia could be adapted to live in secondary treated waste with no aeration, raw waste with aeration, or raw waste in which Tetraselmis or Chlorella had bloomed. The optimal treatment for raw waste was: algal growth with artificial light; addition of Artemia; decantation, followed by additional algal growth; and, final decantation. Sanitary chemical methodology was used to determine parameters of total suspended solids, biochemical oxygen demand, turbidity, odor, orthophosphate, nitrate, nitrita, and ammonia. All of these parameters were reduced by the process to levels associated with at least conventional secondary treatment and possibly tertiary treatment. Implications of mariculture were also discussed. (Prague-FIRL)

TEMPERATURE EFFECTS ON MICROBIAL

GROWTH IN CSTR'S, Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Engineering. R. E. Muck, and C. P. L. Grady

Journal of the Environmental Engineering Division, Vol 100, No EE5, p 1147-1163, October, 1974. 6 fig, 5 tab, 33 ref.

*Waste Descriptors: water treatment, *Temperature, *Biological treatment, Engineering, *Microbial degradation, Microorganisms, Laboratory tests, Nutrient removal, Bacteria, Growth rates

Identifiers: Continuous Stirred Tank Reactors.

In order to apply sound engineering judgment to decisions concerning biochemical processes, including the removal of soluble organics in waste water treatment, it is necessary to quantify the effects of various parameters acting upon them. The effects of temperature upon the four parameters which describe the continuous of growth of a natural microbial population in a Continuous Stirred Tank Reactors (CSTR's) are discussed. Results of the laboratory studies conducted showed that the maximum specific growth rate constant and the bacterial decay rate constant increased with increases in temperature according to the Arrhenius equation over the temperature range of 10 C-30C. The ratio of the temperature characteristics for decay to that for growth was 1.11. The true growth yield was observed to increase as the temperature was increased from 10C to 20C, but to decrease with further rises in temperature. The saturation constant decreased slightly when the temperature rose from 10C to 20C, and then rose greatly when the temperature was increased to 30C. The results of the study agree with the findings of other wor-kers as reported in the literature. It seems that the system may have some effects on the experimental system may have some effects on the effects of temperature on the saturation constant. The system-descriptive parameters analyzed are independent of the operational conditions imposed on waste water treatment systems. By utilizing the equations presented, design engineers can choose the proper treatment conditions for an effluent without having to rely on generalizations about the effects of temperature on plant performance. (Orr-W75-10968

SLURRY DELIQUORING BY EXPRESSION, Nagoya Univ. (Japan). Dept. of Chemical En-

gineering.
M. Shirato, T. Murase, and T. Aragaki.
Dechema Monographien, Vol 74, No 1432/1451, p
9-39, 1974, 27 fig.

Descriptors: *Separation techniques, *Sewage treatment, *Waste water treatment, Sewage sludge, Equations, Filtration.

Identifiers: Solid-liquid systems, Compression, Slurry deliquoring, Expression.

The theoretical developments and subsequent experiments to verify equations concerning the ex-pression process, defined as the separation of a liquid from a solid-liquid system by compression, are discussed. The expression method of deliquoring is widely used in both chemical process industries and in sewage sludge treatments. Its mechanisms consist of two steps of flow phenomena, which may be analysed first by filtration theory and second by consolidation theory Expression operations are seen to be classified into three types: constant pressure; constant rate; and variable pressure-variable rate operations; according to the time-pressure and flow rate rela-tions. Basic laws govern the flow of fluids through porous media, and conventional definitions of filtration and consolidation characteristics aid in developing basic consolidation equations, as well as new definitions of filtration ratio, consolidation ratio, and modified consolidation coefficient. Good agreement between theories and experiments by using compression-permeability cell data was demonstrated. (Prague-FIRL) W75-10969

CHLORINE-CONTAINING ORGANIC CONSTITUENTS IN CHLORINATED EFFLUENTS,

Oak Ridge National Lab., Tenn. R. L. Jolley.

Journal Water Pollution Control Federation, Vol 47, No 3, p 601-618, March, 1975. 3 fig, 7 tab, 29

Descriptors: *Waste water treatment, *Chlorine, Analytical techniques, Chromatography, Municipal wastes, Effluents, *Chlorination, Organic compounds, Sewage treatment. Identifiers: Organic constituents.

An examination was made of the chlorine-containing compounds present in the chlorinated primary and secondary effluents from two domestic waste water treatment plants. A 36C1 tracer, high resolution chromatographic method was used in the ex-amination. Conclusions reached as a result of the study as are follows: stable chlorine-containing organic constituents were present after effluents had been chlorinated to a 1 to 2 mg/liter chlorine residual; anion-exchange chromatographic elution positions were established for these constituents; the chlorination yield was about one percent for a typical chlorinated secondary effluent; the chlorination yield was approximately constant chlorination yield was approximately constant with respect to chlorine dosage, but increased with increasing reaction time; the chlorination yield was about equal for both primary and secondary effluents; the major portion of the available chlorine in the chlorination of effluent was consumed in oxidation, reactions; and researcially sumed in oxidation reactions; and, essentially equivalent results were obtained regardless of whether the effluent was chlorinated with chlorine gas or with hypochlorite solution. (Orr-FIRL) W75-10970

AERATION DEVICES: BASIC THEORY,

Cape Town Univ. (South Africa). Dept. of Water Resources and Public Health Engineering. G. v. R. Marais

Water Pollution Control, Vol 74, No 2, p 172-173,

Descriptors: *Waste water treatment, *Aeration, Equipment, Air entrainment, Bubbles, Aerobic

conditions, Oxygen, Mixing, Dissolved oxygen,

Identifiers: Diffused-air bubble aerators. Mechanical aerators.

Aeration in waste water treatment is the process by which oxygen is supplied to the liquor so that the organisms present are able to oxidize the organic content of the waste water. The three stages of transfer of oxygen from the gaseous to liquid phase are: transfer of the oxygen molecules from the air to the liquid interface; passage of the ox-ygen through a liquid film of about three molecules thick by molecular diffusion; and, dispersion of the oxygen into the body of liquid by further diffusion and convection. The two basic types of aeration devices, diffused-air bubble aerators and mechanical aerators, both utilize the first stage of oxygen transfer. The diffused-air principle introduces small air bubbles through diffusers; oxygen transfer from the interface to the body of liquid is governed principally by the process of molecular diffusion and therefore is greatly affected by surface impurities in the liquid. In mechanical aeration, the shearing action of the impellers creates new interfaces; mass transfer is governed by surface renewal and only slightly af-fected by diffusion transportation. Manufacturers of aeration equipment usually give a figure for the oxygen transfer rate, the mass of oxygen that the aeration device can introduce into a body of water per unit of time-per unit of power absorbed at the aerator shaft. Equations are presented which enable one to modify the manufacturer's figure for oxygen transfer rate to allow the non-standard conditions during operation. (Orr-FIRL)

ADJUDICATING TENDERS FOR AERATION DEVICES: BEST VALUE AND RELIABILITY, J. Halliday

Water Pollution Control, Vol 74, No 2, p 184-185,

Descriptors: *Aeration, Equipment, *Waste water treatment, Costs, Economics. Identifiers: *Aeration devices.

In deciding which aeration device to choose one must consider more than just the capital cost. One method for doing this is to calculate the annual interest and redemption on the capital and add this to a calculated cost of power required. For a conventional aeration plant the annual power cost may equal the annual interest and redemption on aeration equipment, while for an extended aeration plant the cost of power may be twice that of interest and redemption. The efficiencies of all the components of an aeration device must be examined in relation to their particular mode of operation. Efficiencies of all the components of an aeration device tend to decrease with reduced load. This reduction in efficiency must be considered where water levels vary considerably or if there is to be oxygen control by means of two-speed motors or varying the depth of aerator im-mersion. In terms of reliability attention should be given to the drive for the aerator, the gearboxes, bearing life, to methods which prevent the total loss of oil from the gearbox in the event of the failure of the oil seal, and which prevent moisture from getting in the gearbox. Ensuring reliability in the plant begins in the specifications. Reliability costs money and is dependent upon good basic mechanical design. The purchaser should set his minimum standards in the specifications and then perhaps place weight on the additional features ay be offered by various aeration devices. (Orr-FIRL)

SETTLEMENT AND SLUDGE RETURN IN AC-TIVATED-SLUDGE TYPE PACKAGE PLANTS.

Water Pollution Control, Vol 74, No 2, p 197-198, 1975, 2 ref.

Group 5D—Waste Treatment Processes

Descriptors: *Activated sludge, *Waste water treatment, Aeration, Sludge, Dissolved oxygen, *Sludge treatment, *Treatment facilities. Identifiers: Packaged plants. Sludge return.

The sludge in most activated sludge package plants occasionally tends to be light and bulky. This is frequently due to over aeration. To control this, the oxygen input should be arranged so that at peak flow the DO drops to below one mg/liter, while at low flows it rises to 3 or 4 mg/liter. Because of the tendency of package plants to produce a light, flocculent sludge, it is recommended that their sedimentation sections provide for a lower rise rate than that which is normally acceptable for larger plants. It is better to by-pass a portion of the incoming flow when a period of abnormally high flow coincides with a period of abnormally light sludge, rather than to pass everything through the plant and risk losing a large proportion of the activated sludge. Many packaged plants do not have mechanical means for returning sludge but rely instead on the slight difference in density between sludge in the lower portions of the settling zone and the mixed liquor in the aeration zone to make the sludge flow back into the aeration zone by gravity. This type of system has been found unsatisfactory. The best type of package plant has a pump for the return of the sludge. Sludge return ratios in excess of 1:1 are unnecessary unless the sluge level in the settling zone rises to near the overflow level in which case the the ratio may be increased to 1.5:1 or even 2:1. (Orr-W75-10973

UNDERGROUND WASTEWATER TREAT-MENT PLANTS,

Vattenbyggnadsbyran Ltd., Stockholm (Sweden). Water and Environmental Div.

E. Isgard. Journal Water Pollution Control Federation, Vol 47, No 4, p 684-687, April, 1975. 1 fig, 1 tab, 4 ref.

Descriptors: "Waste water treatment, "Construction costs, Water reuse, Design criteria, Odor control, "Treatment facilities. Identifiers: "Underground treatment plants, Ventilation, "Sweden.

The underground construction of water reclama-tion plants is an established technique in Sweden. lems encountered in design and operation of underground plants are discussed. While un-derground facilities were originally designed for civil defense, the present advantages of un-dergrounding are saving of space in urban areas, ease in expansion of facilities, environmental control, and protection against adverse weather. Specific cost problems are related to construction in various types of rock. Design criteria must con-sider expandability; for example, at Kappala, a transport tunnel was built between the existing and future plants. Proper heating and ventilation are necessary, particularly ventilation of hydrogen sulfide from pre-aeration. Measures must be designed for odor control and to prevent inundation and explosions. Careful tightening of excavation is also required to prevent drainage of soil above the excavations and settling of streets or buildings. Such design difficulties have been overcome at many underground facilities in the Stockholm area, providing favorable treatment results. (Prague-FIRL) W75-10974

INNOVATIVE PROCESS TREATS WASTE-WATER, D. A. O'Sullivan.

D. A. O'Sullivan. Chemical and Engineering News, Vol 53, No 18, p 27-28, May, 1975. 1 fig.

Descriptors: *Waste water treatment, *Sewage treatment, *Aeration, *Biological treatment, *Aerobic conditions, Equipment, Pilot plants, Treatment facilities, Identifiers: Deep shaft process.

A deep shaft process for waste water treatment may be considered as the most significant advance in sewage technology in the past 60 years. The advantages of this technique over conventional water treatment methods include: low capital and operating costs; more economical use of land; absence of offensive odor; and, lower production of sludge. The process involves continuous circulation of waste water throughout a vertical shaft. Aerobic bacteria feed on the entrained organic matter. A stream of air injected into the shaft provides both the driving force to maintain circulation and the oxygen necessary for aerobic biological treatment. The unit is a cylindrical steel or concrete shaft, with a diameter between 0.4 and 10.0 m, which extends into the ground to a depth of 100-300 m. The dimensions depend on the volume of effluent to be treated. A unit 135 m deep is capable of efficiently accepting and transferring one kg of oxygen/hr/cu m of effluent. The process results in an overall land saving of about 50%. The large activated sludge ponds and anaerobic digestion units are eliminated. Oxygen uptake efficiency can be 90% or greater in the new system compared with the 10% level achieved in presentday sewage treatment works. A pilot unit has been running continuously treating whole raw sewage from the sewage works at Billingham, Great Britain. (Orr-FIRL) W75-10975

ANAEROBIC ACIDOGENESIS OF WASTE-WATER SLUDGE,

Institute of Gas Technology, Chicago, Ill. S. Ghosh, J. R. Conrad, and D. L. Klass. Journal Water Pollution Control Federation, Vol 47, No 1, p 30-45, January, 1975. 7 fig, 7 tab, 16

Descriptors: *Waste water treatment, *Methane, *Sewage treatment, Anaerobic digestion, Anaerobic Digestion, *Sludge treatment.

Identifiers: *Anaerobic acidogenesis.

The anaerobic digestion process is popular in the waste treatment field because of the following reasons: its capability of stabilizing large volumes of dilute organic slurries at low cost; its low biomass production; the high kill rate of pathogenic organisms; its capability of producing solid residue suitable for use as soil conditioners; and, its ability to convert the organic carbon in the feeds to a product gas stream high in methane that can be substituted for natural gas. This study was designed to determine the feasibility of maintaindominant cultures of acidogenic organisms with waste water sludge feeds by kinetic control, compile information on the biokinetic characteristics of acidogenic organisms; and, to develop guidelines and criteria for operating acid-phase digestion with waste water sludge feeds. A general discussion on the theory and operating principles of the two-phase digestion process is presented with special emphasis on the acidogenic phase of the total process. Results of the study showed that stable, steady-state operation of the two-phase process is possible with waste water sludge for extended time period. The two-phase digestion process may be operated at one-half of the detention time of a high-rate digester and still exhibit higher rates of solids stabilization and methane production. The suggested reason for this high achievement is that phase operation allows the two groups of digester organisms to attain their full metabolic potential and thereby effect substantial improvement in overall digestion efficiency. (Orr-W75-10976

\$3-MILLION AND TWO-AND-A-HALF YEARS TO SOLVE CAMPBELL RIVER'S SEWAGE PROBLEMS,

G. Beardsley. Water and Pollution Control, Vol 113, No 4, p 57-59, April, 1975. Descriptors: *Sewage treatment, *Waste water treatment, Storm runoff, Sewerage, Pipelines, Pumps, Interceptor sewers, Planning, *Canada, *Treatment facilities. Identifiers: *Campbell River(BC).

PHY

Rho

Env C. P

Jou

ref.

wa BC fee gra iro

The ship phe da bl tr

The Campbell River District, British Columbia, has designed a secondary sewage treatment to fit the needs of its population of 11,000. The area had been subjected to intrusion of storm water into the sanitary system. A new collection system and treatment plant were planned and funded from various federal and provincial sources. The entire project was carried out between February 1972 and May 1974. A 14,000 foot long trunk pressure line was constructed so as to serve the area initially by gravity. An eighteen-inch diameter Sclairpipe was chosen for the pressure main. Four pumping stations were installed along the highway. Flygt pumps were used throughout the system. The installation of collector sewers was complicated by the problem of terrain, necessitating grading the trunks continuously because of the shoreline is very close and seepage from the sea was a danger. The plant was designed and screened so as to be aesthetically compatible with its residential surroundings. Public relations efforts were also made and the reaction to the new system was favorable. The plant capacity is currently enough to serve a population of 15,000, with anticipated modular additions for a population of 30,000. (Prague-FIRL) W75-10977

ALGAE REMOVAL USING DISSOLVED AIR FLOTATION,

Ellsworth Engineering and Associates, Idaho Falls, Idaho.

W. F. R. Bare, N. B. Jones, and E. J.

Middlebrooks.

tion, Ferric sulfate, Alum.

Journal Water Pollution Control Federation, Vol 47, No 1, p 153-159, January, 1975. 18 fig, 3 tab, 26 ref.

Descriptors: *Waste water treatment, Algae, Suspended solids, *Flotation, Flocculation, Pilot plants, Laboratory tests. Identifiers: *Algal removal, *Dissolved air flota-

The study described was conducted to evaluate the effectiveness and economic of dissolved air flotation as a method of removing algae from waste water stabilization pond effluents. The operating parameters studied included algae concentration, coagulant dosage, and percentage recycle. Some of the conclusions made, based on bench-scale and pilot plant tests, are as follows: direct pressurization did not provide good suspended solids removal in raw, naturally flocculated, or chemically flocculated algal samples; pressurized recycle greatly improved the removal efficiencies in naturally and chemically flocculated samples; 85 mg/liter of ferric sulfate were required to flocculate an algal suspension of about 100 mg/liter to obtain solids removal greater than 90% in the batch tests; 75 mg/liter of alum were required to flocculate an algal suspension of about 100 mg/liter to obtain solids removal greater than 90% in batch tests; 175 mg/liter of alum were needed to flocculate an algal suspension of about 125 mg/liter to obtain 90% solids removal in pilot tests; and, the difference requirements between pilot plant and bench-scale tests was thought to be caused by a higher concentration of algae in pilot plant tests, a major difference in the algal species being removed, and the dynamic nature of the pilot plant tests as com-pared with the static, ideal conditions of benchscale tests. The total annual cost of operating air flotation system was estimated to range from \$39,000/year for a one mgd plant to \$457,300/year for a 20 mgd plant. (Orr-FIRL.) W75-10978 PHYSIOCHEMICAL TREATMENT OF WASTE-WATER-SEAWATER MIXTURE BY ELECTROLYSIS, Rhode Island Univ., Kingston. Dept. of Civil and

Rhode Island Univ., Kingston. Dept. of Civil and Environmental Engineering. C. P. C. Poon, and T. G. Brueckner.

Journal Water Pollution Control Federation, Vol

47, No 1, p 66-78, January, 1975. 6 fig, 4 tab, 23 ref.

Descriptors: *Waste water treatment, *Electrolysis, *Nutrient removal, *Sea water, Activated carbon, Anodes, Cathodes, Electrochemistry, Phosphorus, Nitrogen, Desalination.

A study was performed to determine the feasibility of a simple and reliable waste water treatment system using electrolysis of waste water and seawater. The process is intended for the removal of BOD, phosphorus and nitrogen, and also for disin-fection. The electrolysis cell employed contains graphite anodes on the bottom of the cell with an iron cathode placed above them. Seawater is used as the anolyte and waste water as the catholyte. The electrolytic cell, operated as a batch unit, was shown to be capable of producing an effluent of higher quality than a secondary effluent. Both phosphates and nitrogen may be effectively removed to meet the most stringent effluent standard. However, some nitrogen content is inevita-ble in the final effluent. Therefore, the batch electrolysis process can be considered extremely effective when control of phosphates is absolutely required, but control of nitrogen is less critical. Polishing of the effluent from batch electrolysis treatment with activated carbon adsorption produce an essentially pollutant-free discharge. The batch operation necessitates the use of small treatment units. A bank of electrolytic cells can be used to handle moderate to high waste water flows. This may be higher in terms of the capital cost, but will add to the flexibility of the plant in terms of operation and expansion plans. The treatment requires no specialized operator training, uses no chemicals, produces a relatively small quantity of sludge, and is unaffected by low temperatures. (Orr-FIRL) W75-10979

DESIRABLE PROVISION IN CURRENT DESIGNS FOR FUTURE DEVELOPMENT IN RELATION TO RECLAMATION OF EF-

National Inst. for Water Research, Pretoria (South

Africa). J. L. Barnard.

Water Pollution Control, Vol 74, No 2, p 177-180, 1975. 3 fig. 4 ref.

Descriptors: *Waste water treatment, *Nutrient removal, *Design, Biological treatment, Denitrification, Sewage treatment, Aeration, Dissolved oxygen, Activated sludge, Nutrient removal. Identifiers: Phosphorus removal, Nitrogen

Modifications to the activated sludge process for the removal of nitrogen and phosphorus necesitate changes in the design and application of aeration equipment. The removal of phosphates from sewage by precipitation without chemical addition has been observed in plug-flow plants. In this case, fine bubble aeration in the last compartment and a minimum DO content of 3-4 mg/liter mixed liquor are recommended. When ferrous sulfate is used to precipitate phosphates (200 mg/liter ferrous sulfate), the oxygen requirements increase to 7.5 oxygen/liter of feed. The modification of the activated sludge process for the total removal of nitrogen involves recycling of nitraterich mixed liquor to a compartment at the head of the aeration basin. The first and third basins are not aerated but stirred to keep the solids in suspension. The DO in the second basin should be kept between one and 2 mg/liter. Therefore, the aerators in this basin should be of such a size and so

located in the basin that they can be switched in or out according to the oxygen requirements. Whether to use surface aerators or bubble aerators depends upon several factors. Surface aerators are generally more economical than bubble aerators when only oxygen transfer efficiency is considered. The cooling effect of the various aerators needs to be considered when nitrification and denitrification are desired since reaction rates decline with decreasing temperatures. Automatic control of DO is recommended since this results in a power cost savings that can offset in two years the cost of the equipment for DO control. (Orr-FIRL)

ICI'S DEEP SHAFT 'HALVES SLUDGE VOLUME',

B. Appleton. New Civil Engineer, April, 1975. 3 fig.

Descriptors: *Waste water treatment, *Sewage treatment, Biological treatment, Equipment, Industrial wastes, Sludge, Treatment facilities. Identifiers: *Deep shaft process, Sludge productional treatment for the process.

ICI's Agricultural Division has developed a new treatment process for raw sewage of industrial ef-fluent. The effluent circulates around a 150 m deep shaft and emerges requiring only final settlement and sludge dewatering. The claims for the deep shaft process include: only 50% of the sludge volume generated by a conventional works; low capital cost; low operating cost; a highly efficient oxygen transfer system makes the process ideal for roughing treatment of high strength liquors; and, absence of odor. The process relies on a colony of bacteria in the circulating liquor to purify the effluent. The effluent circulates vertically in the shaft, completing about 20 circuits in the 2 hour retention time. The air used for biological oxidation also provides the driving force for liquid circulation. The process involves: feeding incoming sewage into a vertical carbon steel tube extending to the bottom of the shaft; recycled sludge from the subsequent sludge-separation stage is added to maintain the bacteria colony; air is injected into the inner tube to provide the necessary oxygen; spent air is vented to the atmosphere at the head of the shaft; and, a conventional overflow weir outlet carries the purified effluent to the sludge separation stage. Deep narrow shafts are preferred for weak liquors requiring high quality treatment, while roughing treatment of high strength industrial waste is most economically pro-vided in shallower broader shafts. One hundred and fifty meters has been chosen as the optimum depth for domestic sewage treatment, the shaft diameter being fixed by the design retention time of 2 hours. (Orr-FIRL)

MEMBRANE DESALTING GETS BIG PUSH, Office of Water Research and Technology, Washington, D.C. For primary bibliographic entry see Field 3A. W75-10982

WATER POLLUTION PROBLEMS IN SALISBU-RY, RHODESIA: PRESENT AND FUTURE, For primary bibliographic entry see Field 5G. W75-10983

NITROGEN REMOVAL IN A PILOT PLANT, Vattenbyggnadsbyran Ltd., Stockholm (Sweden). B. Ericsson.

Journal Water Pollution Control Federation, Vol 47, No 4, p 727-740, April, 1975. 9 fig, 2 tab, 18 ref.

Descriptors: *Nitrification, *Denitrification, *Waste water treatment, Pilot plants, Filters, Tanks, Sludge, Costs, Nitrogen, Nutrient removal, Phosphorus, Identifiers: Phosphorus removal, Sweden.

Nitrogen removal is used as an alternative to phosphorus removal in limiting algal growth. While the method chosen depends on the type of water and dissolved nitrogen compounds, concentrations, and associated costs, the most promising method in Sweden is biological nitrificationdenitrification. Results from a pilot plant operation demonstrated that biological nitrification in a tank system is best accomplished by a double sludge system for combined and separate carbon degradation and nitrification. Critical rate of nitrification at 95% yield was found to be about 3.0 and 2.2 NH3-N/hr/g vss at 18 C and 12 C, respectively. The BOD: NH3-N ratio after pre-sedimentation influences the oxygen requirement, the sludge yield and the acid produced; pH is also very important. The rate of denitrification in the anaerobic filter with plastic media at about 95% yield during the first period at 18 C was about 9 g NO3(-)-N/hr, with a 1.8 hour detention time. The choice between a tank reactor and an anaerobic filter for denitrification depends upon costs and upon operational safety. While the anaerobic filter proved to be safer during the operational trial, it was more expensive. It was recommended that further experimentation be conducted to improve the sludge settleability in the tank reactor system and the system be compared with flotation. (Prague-FIRL) W75-10984

INDUSTRY AND COMMUNITY IN COOPERA-TION.

K-Konsult, Lund (Sweden).

L. Nilsson.

Journal Water Pollution Control Federation, Vol 47, No 4, p 760-763, April, 1975. 4 fig.

Descriptors: *Waste water treatment, Municipal wastes, Biochemical oxygen demand, Biological treatment, Alum, Economics, *Treatment facilities, Industrial wastes.

Identifiers: Sweden, *Combined treatment.

A successful combined municipal/industrial waste A successful combined municipal/industrial waster water treatment facility is described. The plant was designed for the township of Kagerod, Sweden and a milk products industry. The township's population, under 2000, produces about 270 lb of biochemical oxygen demand per day. Industrial waste water is expected to average 1000 lb BOD per day, corresponding to 7500 person equivalents. Average daily flow for the new treatment plant will accomodate 4950 cu ft/hr. 1030 cu ft/hr of this from the milkfood plant. The facility uses biological treatment with the activated sludge method and chemical post precipitation treatment with alum. Sludge is dried with industrial smoke and a Nateko dryer. Operation results since 1972 have been very efficient; water emitted from the plant showed a remainder of 22 mg BOD/gal, 27 mg nitrogen/gal, and 0.9 mg phosphorus/gal, or a reduction of 99, 89, and 99% respectively. The dryer is successful in sulfur reduction as well. The dryer makes it possible to use heating oils with a high sulfur content and still emit less sulfur, thus decreasing costs of heating oil The results of this system are a economical advantage for both industry and the municipality and a cleaner living environment. (Prague-FIRL) W75-10985

WASTEWATER TREATMENT PLANT ODORS: A CONTINUING ENIGMA,

Pittsburgh Univ., Pa. Dept. of Civil Engineering.
R. D. Neufeld.

Public Works, Vol 106, No 3, p 83-84, 106, 107, March, 1975, 1 tab, 22 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Odors, *Municipal wastes, Treatment facilities, Absorption, Adsorption, Organic compounds, Pollution abatement, Pennsylvania. Identifiers: Allegheny County(Penn).

Group 5D—Waste Treatment Processes

One major problem in the operation of both domestic and industrial waste water treatment plants is the control of odors. The Allegheny County Sanitary Authority (ALCOSAN) has built a treatment network for coping with this problem. Because of the complexity of odorants from various sources, six general classifications of techniques for abatement of odorous air have been defined. These are: combustion; adsorption; absorption; vapor mixing; source reduction; and dilution. Source reduction is a difficult defense against odors, and dilution of odors by discharge through tall stacks into the atmosphere is an alternative which has been discouraged. Combustion for complete destruction of organics requires high temperatures for a sufficient time period. Adsorption with activated carbon requires a system design which accounts for the variety of potential odorants, and determines the offending chemical which is most poorly retained on the carbon. Absorption or scrubbing is suitable only when odorous vapors are soluble, reactive, or emulsifiable in water. Also, organic compounds which com-prise most of the odor producing substances in waste are insoluble without the addition of oxi dants. Vapor mixing with odor masking or odor modification is controversial as it is not always successful and it does not reduce the atmospher burden of organic gases but rather increases it ALCOSAN is presently most concerned with fecal odor from sewage sludge process; gases from filters will be ducted into existing incinerators, other control will require chemical oxidation. (Prague-FIRI.) W75-10986

WATER CONSERVATION IN SWEDEN: III. CURRENT TRENDS,

Ministry of Agriculture, Stockholm (Sweden). For primary bibliographic entry see Field 5G.

CARBON REGENERATION BY WET AIR OX-IDATION.

Zimpro, Inc., Rothschild, Wis. W. B. Gitchel, J. A. Meidl, and W. Burant, Jr. Chemical Engineering Progress, Vol 71, No 5, p 90-91, May, 1975. 1 fig, 1 tab, 12 ref.

Descriptors: *Waste water treatment, *Activated carbon, Adsorption, Tertiary treatment, Laboratory tests, Sewage treatment, Physical properties, Water quality, *Oxidation.
Identifiers: *Wet air oxidation, Carbon regnera-

The results of physical and chemical tests and fullscale plant tests on the water quality produced by wet air oxidation regenerated activated carbon are sumn arized. The quality of the water produced by the regenerated carbon was found to be equal to the best obtained by using virgin carbon. Results indicate that wet air oxidation causes some reduc-tion of surface in pores under 10 angstroms radius while increasing surface in all other pores. Absorp-tion isotherms show that most Cl-C4 compounds are not adsorbed even by virgin carbon with a full compliment of surface in the smallest pores. These small carbon compounds are readily removed by biological treatment, suggesting therefore that the surface in 10 angstrom or smaller pores is not es-sential in waste water treatment. The chemical and physical tests show that wet air oxidation does restore all the adsorbate relative efficiencies (R.E.) and pore structure of the parent carbon to a very high degree with the exception of the mentioned small pores. It is concluded that spent carbons may be fully regenerated by wet air oxidation in terms of the application of these carbons. (Orr-FIRL) W75-10988

LAMELLA SEDIMENTATION: A COMPACT SEPARATION TECHNIQUE, Axel Johnson Institutet for Industriforskning,

Nynashamn (Sweden). Engineering Dept

B. Forsell, and B. Hedstroem. Journal Water Pollution Control Federation, Vol 47, No 4, p 834-842, April, 1975. 12 fig, 3 ref.

Descriptors: *Waste water treatment, Sedimentation, *Settling basins, *Separation techniques, Equipment, Sludge treatment.

Identifiers: *Lamella separators, *Lamella sedi-

Lamella sedimentation has the advantages of reducing the demand for large building areas and/or volumes and also of low operating and overall costs. Modern lamella sedimentation techniques have profited from advances in fluid dynamics research and materials technology. A general description of lamella sedimentation is given with reference to the topics of surface effectiveness and compactness, sludge density, sludge volume and resistance to shear forces, flow variations, fluid mechanics, special problems of lamella sedimentation, and the mechanical construction and layout of a lamella sedimentation plant. The area that is theoretically available for separation in a lamella apparatus is equal to the sum of the projections on the horizontal plane of the separation plates. In a continuously working separator, a large enough inclination angle must be chosen so that the sludge separating on the plates may be continuously and efficiently removed. Flow pattern can be either cocurrent or counter current; the choice depends on the fraction of the sludge volume which is light, network forming, low yield stress and which is heavy, finely dispersed, high yield stress. A lamella sedimentation plant consists of a particular number of separating plates working in parallel, large plants may contain several thousand. Smaller plants, less than 250 sq m, may be designed as package plants. In larger plants, the lamella device is usually one step in a process line in which all units are contained in a common concrete building block. (Orr-FIRL) W75-10989

LIQUID CO2 PROTECTS OUR WATER'S QUALITY.

Kansas City Water Dept., Mo. For primary bibliographic entry see Field 5F. W75-10990

VIRUS REMOVAL AND INACTIVATION DUR-

ING WATER TREATMENT, Maine Univ., Orono. Dept. of Civil Engineering. O. J. Sproul.

Journal of the New England Water Works Association, Vol 89, No 1, p 6-15, March 1975. 5 tab, 12 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Viruses, Coagulation, Sedimentation, Filtration, Disinfection, Chlorine, Ozone, Recrea-

tion, Environmental effects.
Identifiers: *Viral removal, Virus inactivation.

The increased use of water for recreational purposes has made it necessary to decrease the viruses in water after treatment. Coagulation and sedimentation, rapid sand filtration and disinfection in a series are used by a complete water treatment plant. Removal of poliovirus can be as high as 99.9% when magnesium is precipitated from the water. Coagulation has also resulted in a high virus removal rate. Filtration through sand can remove viruses completely from treated waste water effluent provided the distance is long enough. Chlorine used properly is an effective viricide. Ozone is also an effective disinfectant. In the future research and development to minimize effects on the environment from viruses through treatment plants would be useful. Standards for treating potable and waste water should also be developed (Dean-FIRL) W75-10991 ACTIVATED CARBON IN THE WATER

Jou 47,

De tio Ef

Th

pla

Da fa to

bi bi fe

TREATMENT PLANT,
Massachusetts Dept. of Public Health, Lawrence. Lawrence Experiment Station. A. E. Sylvia.

Journal of the New England Water Works Association, Vol 98, No 1, p 29-35, March 1975

Descriptors: *Activated carbon, *Treatment facilities, *Waste water treatment, *Water quality standards, Public health, Legislation, Industrial wastes, Surface runoff, Odor, Taste, Potable water, Microorganisms, *Pollutant identification, Identifiers: Carbon chloroform extract, Rapid Fluorescence Technique.

Coal is the source of granular activated carbon commonly used by water treatment plants. Public health officials are concerned not only by the odor and taste problems but also by the chemicals from industrial plant effluents and natural surface runoff entering the public water supply. Activated carbon beds and columns will adsorb the chemi-cals most concerning the public health officials as potential health hazards. The Environmental Protection Agency has been trying to pass a bill that would extend their authority beyond bacteriological quality of water supplies to include physical, chemical, and biological standards. Passage of this legislation would mean that a number of water districts would have to use additional treatment to meet the standards. Carbon Chloroform Extract (C.C.E.) is high on the EPA list. Work is being continued on the development of a rapid fluorescence technique. The method has undergone extensive testing and seems to be valid for measurement of microorganisms in potable water when compared to the CCE method. (Dean-FIRL) W75-10992

HIGH COSTS MODIFY SEWAGE PLANT EX-PANSION.

Engineering News-Record, Vol 194, No 15, p 81-82, April 10, 1975. 3 fig.

*Waste Descriptors: water treatment. *Construction costs, *Treatment facilities, Flow rates, Costs, Potomac River, Biochemical oxygen demand, Nitrogen, Phosphorus compound Estuaries, Cyanophyta, Fishkill, Sludge disposal, Tertiary treatment.

Identifiers: Washington, DC, Blue Plains Sewage Treatment Plant(DC).

Rising construction and energy costs have forced a slowdown in the plans to expand and upgrade by installing an advanced waste treatment system that would remove nitrogen and phosphorus at Washington, D.C.'s Blue Plains sewage treatment plant. The present facility is a modified activated sludge plant handling an average flow of 250 mgd with a peak of 300 mgd with a secondary treatment process removing 70% BOD and suspended solids. The upgraded plant would handle 309 mgd with a peak of 650 mgd and the new modified aeration plant will remove 95.5% BOD, 98% phosphorus and nitrogen and 90% ammonia. Because of Blue Plains' proximity to the Potomac tidal estuary, the removal of both nitrogen and phosphate was be-lieved necessary to end growth of blue-green algae ch has on occasion matted and caused fishkills. If phosphorus removal could slow the growth, construction costs would be lower. Sludge disposal presents another problem. Incineration of the sludge according to present plans would require 50 million kwh of electricity and 13.7 million gallons of fuel oil in 1978. Presently the sludge is being disposed of by burying and surface land disposal. Another solution is selling composted sludge for fertilizer providing the odor problem can be overcome. (Dean-FIRL) W75-10993

MINITEST METHOD FOR MONITORING EF-

FLUENT QUALITY, Uppsala Univ. (Sweden). Algal Assay Lab. E. Elfving, A. Forsberg, and C. Forsberg.

Waste Treatment Processes—Group 5D

Journal Water Pollution Control Federation, Vol. 47, No 4, p 720-726, April 1975. 3 fig, 2 tab, 18 ref.

ER

As-

ili

ile

id

on

u

d

Descriptors: *Waste water treatment, Data collections, Chemical oxygen demand, Water quality, Effluents, Nitrification, Biological treatment, Activated sludge, Analytical techniques, Treatment facilities, *Pollutant identification.

The long-run efficiency of six different treatment plants is described with the use of data obtained by continuous sampling from July 1973 to July 1974. Data include the effects of treatment disturbing factors, such as technical errors, incoming oil, or toxic compounds. Processes demonstrated are biological treatment with activated sludge, and biological treatment in combination with five different types of phosphorus removal systems. In formation was given on PO4-P, total P, NH4-N, NO2-N, NO3-N, AGP, and COD. The analysis of effluents from chemical treatment plants showed that both presimultaneous and postprecipitation gave, at maximum phosphorus reduction, weekly average values of about 0.2 mg/liter. The treatment efficiency was reduced by disturbances and by technical errors. The nitrification processes showed a comparatively high correlation with tem-perature. Some negative AGP values were found. Average COD values were between 30 and 40 mg/liter. (Prague-FIRL) W75-10994

OIL SPILL TECHNOLOGY,

Environmental Protection Service, Ottawa (Ontario). Environmental Emergency Branch. For primary bibliographic entry see Field 5G.

PUMP SELECTION,

Associated Engineering Services Ltd., Vancouver (British Columbia). For primary bibliographic entry see Field 8C. W75-11002

CALCIUM SULFATE SOLUBILITY IN BRACKISH WATER CONCENTRATES AND APPLICATIONS TO REVERSE OSMOSIS PROCESSES: POLYPHOSPHATE ADDITIVES,

Oak Ridge National Lab., Tenn. L. B. Yeatts, P. M. Lantz, and W. L. Marshall. Desalination, Vol 15, No 2, p 177-192, 1974. 7 fig, 2

Descriptors: *Desalination, Reverse osmosis, Water reuse, Potable water, Filtration, Chemical precipitation, Desalination plants, *Waste water treatment.

dentifiers: *Calcium sulphate, Hyperfiltration, Polyphosphate additives.

Most naturally occurring brackish waters contain substances that may foul reverse osmosis mem-branes, such as magnesium, calcium, and sulfate ions, and small amounts of hydroxide ion. The extent to which saline water can be concentrated with hyperfiltration or by the reverse osmosis process to recover pure water is dependent upon the saturation precipitation of these substances. The solubility at 25C of CaSO4 . 2H2O (gypsum) was investigated for three brackish waters at reverse osmosis plants in Gillette, Wyoming, and Webster, South Dakota, and from the Wellton-Mohawk post-irrigation canal in Arizona. It was found that sodium hexametaphosphate, when added in small amounts, produces an apparent increase in the saturation concentration of CaSO4. Calculations for maximum water recoveries and relationships to the reverse osmosis process were discussed. (Prague-FIRL) W75-11004

MILESTONE WATER LEGISLATION ACCOMPANIED BY MILLSTONE OF BUREAUCRATIC

Hampton Roads Sanitary District, Norfolk, Va.

For primary bibliographic entry see Field 5G. W75-11007

HOW TO ESTIMATE AND ESCALATE COSTS OF WASTEWATER EQUIPMENT. ICARUS Corp., Silver Spring, Md.

H. G. Blecker, H. S. Epstein, and T. M. Nichols. Chemical Engineering, Vol 81, No 22, p 115-121, October, 1974. 13 fig, 2 tab.

Descriptors: *Waste water treatment, *Costs. *Equipment, Computer programs, Engineering, Design, Installation, Water works, Alternative costs, Capital costs, Construction costs, Installation costs, Initial costs, Real costs, *Treatment facilities

Charts and tables of cost data are presented to aid in the preparation of conceptual or rough esti-mates of the cost of facilities for treating waste water, or comparing alternative processing schemes. A technique for escalating the estimate to a future time is also described. The cost data were generated as a computer-aided design and estimating system which determines equipment costs in the same way as an equipment vendor and assembles the complete installed costs the same way a contractor does at the definitive stage. Graphs are included giving the purchased-equipment costs (or field-erected cost), equipment-setting manhours, installed-equipment cost, total field-labor manhours, and the labor-to-material ratio. An example of how to determine the escalation of cost is given. To determine the total installed cost for the equipment item in a South Philadelphia treatment plant in the 2nd quarter 1976, the estimated purchased-equipment cost for the 2nd quarter 1975, the material cost (less equipment) for 2nd quarter 1975 and the field-labor cost for 2nd quarter 1976 must all be calculated. The graphs cover such equipment as storage vessels, vertical pressure vessels, field labor for vertical pressure vessels, general-service centrifugal pumps, reinforced concrete aeration basins, motor-driven reciprocating pumps, motor-driven rotary blowers, variable speed motors and rectangular excavations. (Orr-FIRL) .

W75-11014

HOW SILICA AFFECTS IRON REMOVAL FROM GROUNDWATER, Yule, Jordan and Associates, Camp Hill, Pa. En-

vironmental Engineering Div. For primary bibliographic entry see Field 5F. W75-11016

YWA PLAN FOR CLEANER RIVERS. B. Appleton

New Civil Engineer, p 21-22, January 23, 1975.

Descriptors: *Water pollution control, Rivers, *Waste water treatment, Water pollution sources, *Storm runoff, *Sewage treatment, Sewerage, *Overflow, Planning, Industrial wastes. Identifiers: Yorkshire River Authority(Gt Brit).

The Yorkshire Water Authority, Great Britain, has developed plans for water pollution control of its two major rivers. Sources of pollution are both industrial and municipal. One problem is overflow from sewers during storms. Where the capacity of a sewer has been reduced to below twice dry weather flow, serious surcharging occurs during storms, causing pressure buildup so that manhole covers are blown off and sewage flows out of these openings. Infiltration from surrounding groundwater adds to normal surface runoff and thus further reduces the amount of foul sewage retained in the sewer. When the Rother river level rises, discharges from sewage overflows is shut off and sewage flows into the river as the storm abates and river flow drops. Plans include building of new interceptor sewers to pick up sewage from existing and new branch sewers and to carry up to 50 cu m/sec to a low level pumping station. Another development is a trunk sewer to relieve parts of the city. Besides sewerage problems, the area rivers are polluted from mine drainage. Treatment requires aeration for complete oxidation followed by settlement of the ochre. Other plans include an investigation of the possibility of mixing industrial effluents with domestic sewage for treatment at the local sewage plant. (Prague-FIRL) W75-11017

COST SHARING TO HELP CLEAN OUR WATERWAYS.

For primary bibliographic entry see Field 5G. W75-11023

NITROGEN REMOVAL IN THE OPERATION OF THE MILILANI SEWAGE TREATMENT PLANT,
Hawaii Univ., Honolulu. Water Resources

Research Center.

G. L. Dugan, R. H. F. Young, and R. T. Tsutsui. Available from the National Technical Informa-Available Holland Hernauda Technical Information Service, Springfield, Va 22161 as PB-244 718, \$3.75 in paper copy, \$2.25 in microfiche, Technical Memorandum No 44. September 1974. 20 p, 5 fig, 6 tab, 7 ref. OWRT A-047-HI(1), 14-31-0001-4011.

Descriptors: Nitrogen, *Activated sludge, *Anaerobic digestion, *Sewage treatment, Effluents, Eutrophication, Sludge treatment, Sedimentation, *Waste water treatment, Nutrient removal, *Hawaii, Settling basins, Aeration. Identifiers: *Rapid Bloc process, *Nitrogen removal rates.

The effluent of the Mililani Sewage Treatment Plant (STP), Oahu, Hawaii, from January 1972 to January 1973 contained only approximately 30% of the total nitrogen that was originally in its raw sewage. During the period that high nitrogen removal rates were observed, raw sewage flowed directly to the 'Rapid Bloc' activated sludge unit. Sludge stabilization was by aerobic digestion. During the fall of 1973, a primary sedimentation tank and an anaerobic digester (which replaced the aerobic digester) were added to the components of the STP. A study was initiated for a one-year period, 1 July 1973 to 30 June 1974, in an attempt to determine the mechanism for nitrogen removal for both before (Phase I) and after (Phase II) modifications to the STP. The waste water flow during Phase I, July to August 1973, averaged 0.65 mgd with an overall total nitrogen removal of about 54%. The major nitrogen loss in the effluent speculated to be by means of gaseous ammonia to the atmosphere, apparently occurred in the aera-tion unit, settling tank, and aerobic digester. During Phase II studies, January through June 1974, the mean monthly flow increased by approximately 30% and the mean total nitrogen loss decreased to 29%, a range that is typical for conventional secondary activated sludge operations. In both Phases I and II, ammonia nitrogen was the predominant form showing major losses. W75-11041

PROCESS FOR TREATING SEWAGE SLUDGE, American Cyanamid Co., Stamford, Conn. (assignee)

H. P. Panzer, and K. W. Dixon.
U.S. Patent No 3,894,948, 7 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 936, No 3, p 1008, July 15, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, Sludge treatment, Dewatering, Chemical reac-tions, Polymers, Waste disposal. Identifiers: *Chemical treatment.

In the disposal of sludge formed in processing of sewage, it is beneficial to concentrate or thicken the sludges as much as possible to facilitate disposal. A method of treatment is provided which comprises adding to the sludge an effective

Group 5D—Waste Treatment Processes

amount of a water-dispersible polyquaternary polymer consisting essentially of the reaction product of a lower dialkylamine, a polyfunctional amine, and a difunctional epoxy compound selected from the group consisting of epihalohydrins, diepoxides, precursors of epihalohydrins and diepoxides which under alkaline conditions are readily converted into the corresponding epoxy compounds and mixtures thereof. (Sinha-OEIS) W75-11064

PROCESS FOR TREATING INDUSTRIAL WASTES,

Cvanamid Co., Stamford, Conn. American (assignee)

H. P. Panzer, and K. W. Dixon.

U.S. Patent No 3,894,946, 8 p, 8 ref; Official Gazette of the United States Patent Office, Vol 936, No 3, p 1007-1008, July 15, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution treatment, Water quality control, *Flocculation, Chemical reactions, *Polymers.
Identifiers: *Chemical treatment.

A process of flocculating industrial wastes is described in which the wastes are treated with an effective amount of a polyquaternary polymer ob tained from reaction of a major portion of secondary amine, a minor portion of polyfunctional amine and an epoxy type reactant whereby the polyquaternary polymer obtained has a solution viscosity at 25 C of at least 100 centistokes as a 37%, by weight, aqueous solution, based on the cationic portion of the polyquaternary pounds. (See also W75-11067) (Sinha-OEIS) W75-11066

PROCESS FOR TREATING INDUSTRIAL WASTES.

Cyanamid Co., Stamford, Conn. American (assignee)

H. P. Panzer, and K. W. Dixon.

U.S. Patent No 3,894,947, 5 p, 1 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 936, No 3, p 1008, July 15, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution treatment, Water quality control, *Flocculation, Chemical reactions, Polymers. Identifiers: *Chemical treatment

Flocculatable industrial wastes are treated with effective amounts of polyquaternary polymers obtained by reaction of a difunctional epoxy type reactant with a secondary amine to a solution viscosity above a minimum value. This process has a widely diversified range of utility. The high efficiency of the process not only enables greater solids removal to be effected but allows desirable removal to be achieved at lower flocculant usages than is conventionally required. (See also W75-11066) (Sinha-OEIS) W75-11067

ELECTROLYTIC SEA WATER PROCESS, Diamond Shamrock Corp., Cleveland, Ohio. (assignee) For primary bibliographic entry see Field 3A. W75-11068

AEROBIC LAGOON WASTE TREATMENT

AEROBIC LAGOON WASTE TREATMENT SYSTEM AND METHOD, Kimberly-Clark Corp., Neenah, Wis. (assignee) A. R. Le Compte, Jr., and D. W. Appel. U.S. Patent No 3,893,924, 5 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 660, July 8, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water quality control, Water

pollution treatment, *Aerobic treatment, Aeration, Water circulation, Lagoons, *Sewage lagoons, Aerated lagoons, Jets.

A highly efficient system and method for effectively treating liquids containing waste materials are disclosed. By the selection and placement of specific types of aerators it is possible to operate an aerobic lagoon at a fraction of the power requirements heretofore thought necessary. The system includes the use of jets placed within the liquid and directed so as to form primary circulation cells having an average velocity of at least about 0.3 foot per second and secondary circulation within the cells sufficient to substantially prevent solids which have been subjected to primary separation from settling out. The flow within the cell is designed to be complementary to adjacent cells and create a serpentine path from in-flow to outlfow of the lagoon. A quiescent zone may be provided within the lagoon for sludge settling, or a separate polishing pond may be utilized. (Sinha-OEIS) W75-11069

MOBILE UNIT FOR TREATING LIQUID

Chemfix, Inc., Pittsburgh, Pa. (assignee) D. J. Opacic, A. L. Lengyel, E. A. Zawadzki, and F. H. Jackson.

U.S. Patent No. 3,893,656, 4 p, 13 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 576, July 8, 1975.

Descriptors: *Patents, *Waste water treatment, Industrial waste, *Waste disposal, Water pollution control, Water quality control, Equipment, Liquid

Identifiers: Setting agents, Mobile equipment.

A mobile unit for treating liquid waste to render it non-polluting and fit for ultimate disposal includes a mixing hopper having an inlet for receiving liquid waste, and an outlet for connection to a conduit extending to the disposal area. The unit also includes a bin for a powdered setting agent for a liquid alkali metal silicate. The bin has an outlet at its bottom and a porous floor spaced above its bottom. Compressed air is delivered to the space beneath the floor to form a fluidized bed of setting agent above the floor. The setting agent is delivered to the mixing hopper in which it is mixed with the liquid waste. After the mixture leaves the hopper, liquid alkali metal silicate from a tank in the mobile unit is delivered to the mixture. The treated waste will set after it has reached the disposal area. (Sinha-OEIS)

LOW TEMPERATURE WATER PURIFICATION

SYSTEM, Control, Inc., South Barre, Vt. (assignee) For primary bibliographic entry see Field 5F. W75-11074

WASTEWATER TREATMENT PLANT. Autotrol Corp., Milwaukee, Wis. (assignee)

W. N. Torpey. U.S. Patent No. 3,894,953, 5 p, 5 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 936, No 3, p 1010-1011, July 15, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Organic wastes, Water pollution control, *Septic tanks, Separation techniques, Anaerobic digestion, Biological treatment, Hydrogen sulfide, *Treatment facilities.

A modified septic tank with troughs arranged to be fed in parallel controls the detention time of wastewater passing through the troughs to the range of from 2 to 4 hours thereby minimizing the addition of gasses to the effluent wastewater, particularly hydrogen sulphide that is evolved in the lower portion of the tank in connection with the digestion of settled organic solids. The substantial reduction in hydrogen sulphide in the effluent wastewater from the septic tank makes available a maximum amount of surface for the growth and maintenance of organisms oxidizing carbonaceous and/or nitrogenous pollutants on the downstream rotating contactors. A biological treatment unit such as those employing rotating contactors can be provided to treat the effluent from the septic tank. (Sinha-OFIS) W75-11076

FLOCCULATION DEVICE FOR WASTE FLUID

TREATMENT, Wheelabrator-Frye Inc., New York. (assignee) V. K. Walther, K. Beckschafer, and K. E. Temme. U.S. Patent No. 3,893,921, 3 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 659, July 8, 1975.

Descriptors: *Patents, *Waste water treatment, *Water purification, Water pollution treatment, *Coagulation, *Flocculation, Equipment. Identifiers: Vibration.

An apparatus for coagulating and flocculating waste fluid includes a tank attached to a vibrating treatment device from which the waste fluid is discharged. A variable rate pump or other means injects a flocculating agent into the tank, where it is effectively mixed with the waste fluid due to the vibration of the treatment device. The waste fluid containing the flocculated material in suspension is then discharged from the tank for subsequent separation, as by filtration, centrifuge or the like. The apparatus employs a siphon-like arrangement to obtain greater efficiency under a continuous flow mode of operation. (Sinha-OEIS) W75-11077

TOTAL WASTE RECYCLE SYSTEM FOR WATER PURIFICATION PLANT USING ALUM AS PRIMARY COAGULANT.

Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environ-

resource Recovery and Conservation, Vol 1, No 1, p 67-84, May 1975; 4 fig, 10 tab, 34 ref. WA85-188, WA86-361.

Descriptors: *Waste water treatment, *Water treatment, Water quality, *Sludge treatment, *Recycling, *Coagulation.
Identifiers: Acid treatment, Alkaline treatment, Alum sludge, Zero waste discharge, Resource recovery, *Waste recycling, Filter backwash water Alum recycle.

recovery, *Waste water, Alum recycle.

A systems study to investigate the feasibility of total recycle of wastes generated from water purification plants has been conducted. Wastewater and alum sludge used in were collected from a water plant employing water treatment processes including aeration, chemical addition, mixing, flocculation and sedimentation followed by filtration, pH adjustment, fluoridation and chlorination. Wastewater and sludge are generated mainly from the sedimentation basin and the filter backwash. The waste recycle system studied consisted of (a) treating the filter backwash water in a sludge separator, (b) dividing the combined sludge into two fractions for alum solubilization respectively in an acid treatment unit and an alkaline treatment unit, (c) screening the inert silt for ultimate disposal, and (d) returning the solubilize alum from the acid and alkaline treatment units in proper proportions for reuse as flocculation agent. The proposed recycle process was designed to provide a cost effective system for achieving zero' waste discharge from a water purification plant. Inasmuch as the inert silt collected during water treatment is derived from raw water supply an elimination of added chemical discharges i

be regarded as satisfying the desired 'zero' discharge objectives. Although detailed process design parameters necessary to achieve the above stated goal have not been established, experimen-tal results tend to suggest that practical designs based on the proposed recycle system are feasible. W75-11094

THE EFFECTS OF FREE AMMONIA AND FREE NITROUS ACID ON THE NITRIFICA-TION PROCESS.

Cornell Univ., Ithaca, N.Y.

A C. Anthonisen. Available from University Microfilms, Inc., Ann Arbor, Mich, 48106. Order No 74-24,253. PhD Thesis, 1974, 323 p.

Descriptors: *Ammonia, *Nitrification, Municipal wastes, *Waste water treatment, Nitrites, Nitrates, Pilot plants, Microorganisms, Bacteria, Acids, Denitrification, Inhibition.

Identifiers: Un-iodized ammonia, Un-iodized nitrite, Nitrobacter, Nitrosomonas, *Nitrous acid.

Research has been conducted on the accumulations of nitrite as observed in soil, natural waters and waste treatment systems which receive industrial, agricultural, and municipal wastes. The hypothesis postulated was that un-ionized ammonia (FA) and unionized nitrite (FNA) are inhibi tory to nitrifying organisms and their effects cause nitrites to accumulate and persist. Both laboratory and pilot plant tests were completed to investigate the reaction rates for the organisms Nitrosomonas and Nitrobacter. Results indicated that FA inhibition to Nitrobacter occurred at concentrations much lower than those required to inhibit Nitrosomonas. Nitrites thus accumulated without subsequent oxidation to nitrate. In liquid waste systems, accumulation of nitrite was shown to be directly related to concentrations of FA and FNA and independent of pH, ammonia and nitrite con-centrations. FA inhibits Nitrosomonas nitrifica-tion at 10.0 to 150.0 mg/liter; FA inhibits Nitrobacter at 0.1 to 1.0 mg/liter; and FNA inhibits Nitrosomonas and Nitrobacter nitrification at 0.22 to 2.6 mg/liter concentration. It appears possible to control the nitrification patterns that occur during the oxidation of ammonia using operational procedures that consider the inhibitory effects of FA and FNA. (Prague-FIRL)

MEASURES OF BIODEGRADABILITY REFRACTORY ORGANICS IN WASTE-WATERS: (ANALYSIS, INTERPRETATION, AND APPLICATION OF MEASUREMENT TECHNIQUES),

Connecticut Univ., Storrs

F. L. Hart.

Available from University Microfilms, Inc., Ann Arbor, Mich, 48106. Order No 75-10,627. PhD Thesis, 1975, 125 p.

Descriptors: *Measurement. *Oxidation. Nitrification, *Hydrogen, Carbon. *Analytical techniques, Mumouegradation, "Analytical techniques, Municipal wastes, Industrial wastes, "Waste water treatment, "Pollutant identification, "Refractivity. Identifiers: Refractory Index(RI), Ultimate Oxygen Demand(UOD). *Biodegradation.

The Ultimate Oxygen Demand (UOD) method for evaluating the total amount of oxidizable material bearing hydrogen, oxygen, carbon, and nitrogen, in waters was developed. A working parameter was formulated to approach the derived evaluation based on output responses of available analyzers. A modified Warburg Respirometer is used to determine the biodegradable portions of the total materials present, with a correction term for nitrification inconsistencies. The ratio of degradable material to the total oxidizable material is the Refractory Index (RI). The formula is RI = BOD(ultimate)/UOD. According to this index, easily degradable materials such as domestic raw sewage or glucose have RI values of 0.97 and 0.93, indicating 93-97% degradation, while industrial dye wastes or benzene have RI values of 0.56 and 0.23. Specific organic compounds were classified in terms of bio-persistence, using the RI values. Other uses of these values are suggested, such as the evaluation of acceptability of industrial waste discharge to municipal biological treatment facilities or the use as a preliminary treatment parameter. (Prague-FIRL) W75-11103

WATER TREATMENT BY OZONE, (IN JAPANESE),

K. Oda.

Seikatsu Eisei, (J. of Urban Living and Health Assoc), Vol 18, No 6, p 168, 1974. 13 fig. 20 ref.

Descriptors: *Waste water treatment, *Reviews, *Water treatment, *Ozone, Oxidation, Detergents, Organic compounds, Color, Odors. Identifiers: Reaction time, Decolorization, Deodorization.

The use of ozone for water treatment is reviewed. The greatest advantage of ozone usage is that it does not give any reaction residue. Ozone is one of the strogest oxidizing agents, therefore it decomposes most compounds in a relatively short reaction time. Ozone can be used for decolorization, deodorization, sterilization, and decomposition of organic compounds as well as of inorganic compounds such as cyanides. The sterilization effect of ozone is 15 to 30 times stronger than that of chloride gas or hypochlorous acid. Most decomposition of unsaturated organic compounds by ozone is believed to proceed by ozonolysis fol-lowed by aldehyde formation and stable organic acid formation. Ozone is also useful in treating synthetic detergents such as alkyl benzene sul-fonate for which biological treatment is very difficult. If ozone alone is used to treat water, a l amount of ozone consumption is needed and the process is less economical. Therefore, ozone treatment is recommended for use with other water treatment methods such as activated carbon and floatation techniques. (Katayama-FIRL) W75-11107

ACTIVATED CARBON ADSORPTION TECHNIQUE FOR THIRD STAGE SEWAGE WATER TREATMENT, (IN JAPANESE),

T. Kasakura. Kankyo Sozo, (Environment Creation), Vol 5, No 1, p 72, January, 1975. 10 fig, 3 tab, 7 ref.

Descriptors: *Waste water treatment, *Activated carbon, *Sewage treatment, Tertiary treatment, Pilot plants, Filtration, Precipitation(Chemical), Adsorption, Turbidity, Phosphorous. Identifiers: Aluminum sulfate, Adsorption towers.

A pilot plant to test the activated carbon adsorption technique for the third stage treatment of sewage water was constructed and operates at Nagoya city. The third stage water treatment plant consists of precipitation, filtration, and adsorption processes. After second stage treatment by an activated sludge method, sewage water is mixed with aluminum sulfate to precipitate most of the phosphorous compounds. The precipitates are filtered out at the rate of 350 m/d before entering an adsorption tower filled with 320 kg of activated carbon, with average particle sized of 0.90 mm. An average 72% of the total phosphorous in the second stage water was removed by the precipita-tion treatment, and 99% was further removed by the activated carbon treatment. The turbidity of the second stage water was improved an average 79% and 97% by aluminum sulfate precipitation and activated carbon treatments, respectively. The COD values in the precipitation and adsorption processes were 19.5 ppm and 1.8 ppm, respectively, and the corresponding TOD values were 38.9 ppm and 18.8 ppm. Several adsorption towers were installed in parallel and sewage water flowed through at the rate of 300 m/d. The life of activated carbon was between 800 to 1200 hr dependent on temperature which affected the efficiency of activated sludge treatment. The regeneration of deactivated carbon was seen to be achieved by heating at 800 C for 90 min. (Katayama-FIRL) W75-11108

ON-SITE HYPOCHLORITE GENERATION. Salford Univ. (England).

Processing, Vol 21, No 3, p 6-7, 1975. 4 fig.

Descriptors: *Waste water treatment, *Sodium compounds, *Sewage treatment, *Municipal wastes, Electrolysis, Chemical industry, Industrial wastes, Equipment, Oxidation, Odors, Chemical oxygen demand.

Identifiers: On-site generation, Sodiu hypochlorite, Great Britain, *Hypochlorite cells.

It has been shown that on-site generated sodium hypochlorite has several uses. The application for which this process has the greatest potential is in the treatment of municipal sewage. A sucessful demonstration of the process at Guernsey, Great Britain, involved pure seawater electrolysis followed by its passage to a separate stirred reactor tank where it was contacted with sewage. In the United States, Several installations using on-site hypochlorite generation are in operation. In Clark County, Nevada, only the supernatant liquid from the primary digester, rather than a full effluent stream, was electrolytically treated. Liquor was passed through the acutal electrolysis cell using electrodes of Pb02; benefits were attributed to direct oxidation of dissolved or suspended matter at the electrode surface. Vigorous evolution of gases achieved flotational effect. The froth that gases achieved Hotational effect. In a flow formed carried with it a high proportion of solids, leaving the liquor lower in COD. Modern commer-cially available hypochlorite cells are described; all were of the florce-flow, narrow gap design. The treatment processes detailed are also useful in oxidizing and disinfecting within the chemical indus-try, in heat exchanger fouling control, in deodoriz-ing for tobacco plants, and in sterilizing of food processing equipment. (Prague-FIRL) W75-11109

OPTIMUM VALUES FOR OPERATIONAL VARIABLES IN TURBIDITY REMOVAL,

Mosul Univ. (Iraq).

M. A. Al-Layla, and E. J. Middlebrooks. Water and Sewage Works, Vol 121, No 8, p 66-69, August, 1974. 9 fig, 3 tab, 8 ref.

Descriptors: *Flocculation, *Water treatment, *Turbidity, *Alum, *Mathematical models, Operations, Treatment facilities. *Waste water treat-Identifiers: Alum dosage, *Turbidity removal.

A study was designed to define the effect of the main variables that can influence the efficiency of present flocculation basins in water treatment plants, thereby contributing to improving the design of flocculation basins. Variables were paddle speed, time, and alum dosage. The other objectives were to determine the interactions between time of flocculation and alum dosage, flocculation time and paddle speed, and paddle speed and alum dosage, flocculation time, and paddle speed. Methods included analysis of variance, linear, logarithmic, and multivariable mathematical models. It was concluded that the most significant idenpendent variable was paddle speed followed by flocculation time and alum dosage; dosage was mg/liter for the study conditions; optimum paddle speed ranged between 40 and 50 rpm; and op-timum flocculation time was about 30 minutes. Certain equipment and methods were shown to be important in removal of turbidity from water treatment plants. These were variable speed flocculator paddles, multiple flocculation basins that can be used in series or parallel operation, and the use of

Group 5D—Waste Treatment Processes

jar tests to determine the optimum alum dosage continuously during the operation of water treatment plants. (Prague-FIRL) W75-11110

A SOLUTION TO PUMP STOPPAGES, Irvine Ranch Water District, Calif. For primary bibliographic entry see Field 8C. W75-11111

A PLANNING OF CATCHMENT SEWERAGE FOR OYODO RIVER (IN JAPANESE),

M. Ishiguro, and Y. Watanabe.
Miyazaki Daigaku Kogakuru Kenkyu Hokoku,
(Research Report of Miyazaki Univ., Dept. of Engineering), No. 20, p 35-45, August 1974. 5 fig, 12 tab. 20 ref.

Descriptors: *Sewerage, *Planning, *Waste water treatment, *Water quality control, Construction costs, Rivers, Water pollution, Treatment facilities, Biochemical oxygen demand, Waste treatment, Activated sludge.

Identifiers: *Oyodo River(Japan), Catchments.

A plan of catchment sewerage for protecting water quality of the Oyodo River in Japan is discussed. Present and future water quality were analyzed according to observed data. The river catchment area was divided into three blocks and the water pollution loads in each block were estimated. Within each area, construction-maintenance costs and treatment efficiencies of various sewer transport-treatment systems were compared. It was concluded that construction of high degree treatment plants with an activated sludge process for 95% BOD removal should be implemented in all three blocks. However, a treatment plant of 95% BOD removal is very difficult using present

three blocks. However, a treatment plant of 95% BOD removal is very difficult using present techniques. Thus, it was advised to use other treatment processes simultaneously. These included irrigation treatment, oxidation ponding, lagooning, and a rotating biological contactor process, in addition to a plant of 88% BOD removal with an activated sludge process. (Prague-FIRL) W75-11113

ADVANCED WASTEWATER TREATMENT (IN JAPANESE),

M. Shimodo, and Y. Okada. Onoda Kenkyu Hokoku, (Research Reports of Onodo Cement Co.), No. 26, p 92-98, 1974. 11 fig, 9 ref.

Descriptors: *Waste water treatment, *Tertiary treatment, Nitrogen, Phosphorus, Lime, Precipitation(Chemical), Calcium carbonate, Calcium hydroxide, Inorganic compounds.

Advanced waste water treatment technology is utilized to remove pollutants which are not adequately removed by conventional secondary treatment processes. Such pollutants include soluble inorganic compounds (phosphorus, nitrogen) which may support algal growth in receiving water. Lime precipitation is the most useful technology for removal of phosphorus compounds from waste water. The chemical reactions of lime precipitation involve the condensed phosphate being readily hydrolyzed in the presence of Ca2+ and OH-. Calcium hydroxide then reacts with orthophosphate to precipitate calcium hydroxyapatite. As pH increases above 10.0, the precipitation of calcium hydroxyapatite increases, so that phosphate removal is improved with increasing pH. Also, calcium-hydroxide reacts with the bicarbonate alkalinity of waste water to form calcium carbonate alkalinity of waste water to form calcium carbonate and calcium hydroxide is regenerated. (Prague-FIRL)

HUNTINGDON RESEARCH CENTRE PASVEER OXIDATION PLANT--SIX YEARS ON, Huntingdon Research Centre (England). Dept. of Building and Maintenance. B. J. Spring, and E. R. E. Briscoe. Public Health Engineer, Vol 14, p 35-39, March 1975. 4 tab.

Descriptors: *Waste water treatment, *Design criteria, *Activated sludge, *Oxygenation, Biochemical oxygen demand, Oxygen requirements, Oxidation lagoons, *Treatment facilities. Identifiers: Oxidation channels.

The operation of the waste water treatment plant (Pasveer Oxidation Plant) at the Huntingdon Research Centre is described for the years follo ing its installment in 1966. The capacity of the system to absorb heavy temporary overloading was established but the increased loading and greater sludge production increased the time required to clear the draw-off system and also increased the time required to draw-off the total volume, thus reducing the time available for ox-ygenation. The reduction of oxygenation time made additional oxidation capacity necessary. To meet the oxygen input requirement, a Flygt Pump, type CG 3605, was installed in May, 1971. In October, 1972, a new oxidation channel began operation. Several charts are included which show the average daily flow based on a 7-day week, the average daily flow based on a 5-day week, and the peak daily flow for every month in the years 1967 through 1973. The results of studies performed throughout 1968-1971 are presented in chart form. These include: BOD loading in terms of kg/d and percent of design limit; BOD in the raw waste, channel discharge, and final effluent; suspended solids in the raw waste, channel discharge, and BOD reduction overall in the channel discharge and final effluent. It is apparent from the records of the plant that there is no 'typical day' and that the volumes and characteristics of the waste vary considerably and do not follow any consistent pattern. The plant has had no odor problem of any kind and a recreational area is being planned for its surrounding land. (Orr-FIRL) W75-11115

INVESTIGATIONS ON THE LONG TERM BIOCHEMICAL OXIDATION OF SEWAGE,

Water Pollution Control, Vol 74, No 2, p 231-233, 1975. 2 fig, 1 tab, 16 ref.

Descriptors: *Sewage treatment, *Waste water treatment, *Biochemical oxygen demand, *Biodegradation, Nitrification, Nitrogen compounds, Organic compounds, *Oxidation. Identifiers: *Biochemical oxidation.

The biochemical oxidation of sewage occurs in two broadly distinct stages, the first of which is attributed to the oxidation of the carbonaceous compounds present in the sewage, and the second to the oxidation of the nitrogenous matter present. However, the dichromate value of sewage which closely approximates the total carbonaceous oxygen demand greatly exceeds the first-stage BOD thus indicating that only part of the carbonaceous material is oxidized in the first step. Experiments performed determined that the remainder is inert to biochemical oxidation and is not oxidized along with the nitrogenous matter during the second stage. It was found that a second stage of biochemical oxidation of sewage is due to the fact that an induction period of about eighteen days (for the proliferation of the nitrifying organisms initially present) is necessary before nitrification can begin. This lag period is coincidental with the time required for the carbonaceous oxidation rather than caused by an inhibiting effect of carbonaceous matter on the nitrifying organisms as had been previously thought to be the reason for the lag time. (Orr-FIRL)

TREATMENT METHODS OF GROUNDWATER CONTAINING A LARGE QUANTITY OF HUMIC ACID (AUFBEREITUNGSVERSUCHE AN EINEM STARK HUMINSTOFF.
BELASTETEN TIEFENGRUNDWASSER),
T Harme and D Fisheledgerfer

T. Harpe, and D. Eichelsdoerfer. Vom Wasser, Vol 42, p 207-220, 1974. 7 fig, 3 tab, 10 ref.

Descriptors: *Humic acids, *Groundwater, *Waste water treatment, Water treatment, Organic compounds, *Filtration, Pilot plants, Aeration. Identifiers: *Germany(Hamburg-Curslack).

Treatment of water containing humic acids must consider special problems. Humic acids were identified in order to study their reactivity under different treatment methods. Experiments on deep groundwater with a high content of humic acids from Hamburg-Curslack, Germany, are reported. Colloidal brown humic acids were identified. The colloidal form was highly unstable against air oxygen. Thus, experiments were conducted to eliminate the organic matter by filtration on a pilot plant scale. In a closed system, raw water was filtered after aeration, using different filter materials. Without additional flocculants, humic acids can be removed to 3% of their original content. (Prague-FIRL)

OXIDATION OF ORGANIC COMPOUNDS IN WATER (OXIDATION ORGANISCHER VERBINDUNGEN IN WASSER),

C. Bannert, and P. Speiser. Vom Wasser, Vol 42, p 221-239, 1974. 3 fig, 12 tab, 14 ref.

Descriptors: *Oxidation, *Waste treatment, *Organic compounds, *Waste water treatment, Gas chromatography, Pollutant identification. Identifiers: *Hydrogen peroxide.

The oxidative treatment of polluted water containing organic impurities is becoming increasingly inportant. The oxidative degradation of all organic material to carbon dioxide was studied by treating pure organic compounds (serving as models for common impurities) with hydrogen peroxide. The organic compounds were treated in aqueous solution for 15 minutes at 150, 225, and 300C with hydrogen peroxide in the presence of catalysts. The optimum oxidation was found to occur in a 3 to 5 pH range and at 225C. Temperature increases to 300C as well as greater than stoichiometric additions of hydrogen peroxide were found to achieve no better oxidation effects. The concentration of the organic pollutants had no influence on the oxidation effect in the range investigated. The organic residuals were measured by gas chromatography as total organic carbon. (Orr-FIRL) W75-11118

NITROGENOUS CHANGES DURING THE SET-TLEMENT OF SEWAGE,

Water Pollution Control, Vol 74, No 2, p 234-235, 1975. 1 tab, 3 ref.

Descriptors: "Waste water treatment, "Sewage treatment, "Nitrogen, Organic compounds, Ammonia, Settling basins, Treatment facilities. Identifiers: Organic nitrogen.

It is known that there is a reduction in organic nitrogen during settlement of sewage. Two theories to account for this phenomena are that the reduction is due to biological activity, independent of settlement, or that reduction is due to conversion of part of the organic nitrogen to ammonia. In a test, the amounts of ammoniacal and organic nitrogen present were determined for samples of sterilized and unsterilized sewage, both when fresh and when 18 hours old. On the average, organic nitrogen was reduced by 48.8% during settlement for 18 hours. However, 32.5% of this was independent of settlement, implying that only 16.3% was actually due to deposition. An increase of

W75-11125

25.0% in the amount of ammoniacal nitrogen present was clearly due to the decomposition of nitrogenous organic matter. The resulting reduction in the total amount of nitrogen effected by settlement was only about 8%. As there was no change in nitrogenous constituents of sterilized samples, the effects of biological activity are confirmed. In routine analysis of sewage in a facility, samples are 24 hour composites compounded hourly from individual samples, with varying degrees of conversion of organic nitrogen to ammonia having occurred. Thus, although an increase in ammonia concentration is noted in sewage settlement, exact changes taking place in nitrogenous constituents of sewage during passage through sedimentation tanks is not usually measured. (Prague-FIRL)

AERATION DEVICES: THE MANUFACTURER'S VIEWPOINT,

I. R. M. Greig. Water Pollution Control, Vol 74, No 2, p 191-192, 1975. 2 ref.

Descriptors: Equipment, *Aeration, *Waste water treatment, *Sewage treatment, Sludge, Design criteria, Tanks, Construction costs, Sludge disposal, Economics, Treatment facilities, Africa. Identifiers: *South Africa, Extended aeration, Aeration tanks.

Technical specifications for sewage treatment systems utilizing aeration are discussed, in particular those used in South Africa. The current practice used is extended aeration. The system involves only one basic process line with long retention in the aeration tanks, and limited experience is necessary for operation of facilities. Also, extended aeration offers economic advantages over conventional plants in construction costs. Problems with extended aeration include sludge development with poor settling characteristics due to denitrification and a predominance of filamentous organisms. Also, the sludges produced by this process are voluminous, and difficult to consolidate and dry. Since 1966, however, aeration has been the predominant process for activated sludge treatment. Facilities are being designed for nitrification and biological denitrification within the same plant. The relationship between equipment and tank design is critical because different aerators have bery different operational characteristics. Oxygenation efficiency of an aerator is directly related to volume of the aeration tank. Depth is the most important criterion and most manufacturers prefer shallow (up to 3 m) tanks to eliminate the use of baffles, bottom mixing turbines, or draught tubes. It was concluded that aeration tank design should be decided by the mechanical equipment supplier in order that the most suitable geometry be chosen for a particular aerator design. (Prague-FIRL)

12

uth

5,

ge

nic

er-

nic

in-3% SIMPLIFIED WASTE WATER PURIFICATION THROUGH PHYSICAL-CHEMICAL TREATMENT (VEREINFACHTE ABWASSER-REINIGUNG DURCH PHYSIKALISCH CHEMISCHE BEHANDLUNG),

K. R. Dietrich. Wasserwirtschaft, Vol 65, No 5, p 125-129, May 1975. 1 fig, 4 ref.

Descriptors: *Waste water treatment, *Sewage treatment, Flotation, Flocculation, Adsorption, Drainage, Chemical precipitation. Identifiers: *Physico-chemical treatment.

Physico-chemical treatment of sewage is described as characterized by flocculation, precipitation, absorption, and flotation. Chemicals are applied successively and have a high reaction capacity with colloids by opposite charging. They also have a high adsorptive capacity for the oxygen depleting dissolved organic matter found in

sewage. Flotation is a result of oxidation with air in the presence of chemicals acting as catalysts. The subsequent result is an improvement of drainage ability of silicate sludge. (Nave-FIRL) W75-11122

CHEMICAL-BIOLOGICAL TREATMENT WITH BIOLOGICAL FILTERS, Salisbury City Engineer's Dept. (Rhodesia).

Water Pollution Control, Vol 74, No 2, p 160-165, 1975. 2 ref.

Descriptors: *Biological treatment, *Waste water treatment, *Lime, Pilot plants, Capital costs, Filters, Phosphates, Denitrification, Operation, Sludge treatment, Treatment facilities, Africa. Identifiers: Phosphate removal, Recarbonation,

Pilot scale experiments with lime addition at the primary stage of a conventional works is discussed. The objective of the study was to find a process which could initially be used on a seasonal basis, requires little capital expenditure, and can be used with existing treatment facilities. A pilot facility was tested at Salisbury, Rhodesia, after laboratory study. Lime precipitation with recarbonation enabled the filter to work well. Costs for lime storage, dosing, and pH control were low; major capital expenditure would be necessary only if denitrification, suspended solids removal and sludge recalcining were needed. It was concluded that conventional biological filter plants could be converted for phosphate removal at low cost, without excessive revenue expenditure. Under certain circumstances, it might be economic to use lime to reduce overload on a works rather than to extend it. If phosphate removal was needed on an overloaded works, the process would be very economical. Effluents from this system would be well suited to treatment by denitrification. Because necessary installation would not interfere with normal operation, the system is applicable for seasonal use in conjunction with a farm. (Prague-FIRL)

AERATION BY MEANS OF BLAST NOZZLE--A POSSIBILITY FOR THE AERATION OF BIOLOGICAL WASTE WATER TREATMENT PLANTS (DIE STRAHLDUESENBEGASUNG-EINE MOEGLICHKEIT ZUR BELUEFTUNG BIOLOGISCHER KLAERANLAGEN), H-H. Daucher, P. Kroetzsch, K. H. Popp, and R. Stickel.

VDI-Berichte, No 218, p 239-249, 1974.

Descriptors: *Waste water treatment, *Aerators, *Activated sludge, Oxygen, Municipal wastes, Industrial wastes, Aeration, Equipment, Biological treatment, Treatment facilities.

A blast nozzle aerator and its use for the aeration of activated sludge in biological waste water treatment plants is described. Blast nozzles are placed horizontally near the bottom of the aeration tank. These blow air, oxygen-enriched air, or oxygen into the water, while performing a rotary motion due to the tangential arrangement of the nozzles. The rotary motion provides for necessary circulation of the water. At an immersion depth of 1.6 m, the oxygen input ranges from 1.5 to 2.5 kg of dissolved oxygen per kWh, while nozzles with 4 m immersion reach oxygen inputs over 4 kg/kWh. The blast nozzles are equally suitable for the aeration of municipal and industrial waste water. (Takacs-FIRL)

LIMITATIONS OF USING A SIMULATION MODEL OF THE SOIL UNDER IRRIGATED CULTIVATION TO SIMULATE THE FUNCTIONING OF THE SOIL AS A PURIFYING SYSTEM (LIMITES D'UTILISATION D'UN

MODELE DE COMPORTEMENT DU SOL SOUS CULTURE IRRIGUEE POUR SIMULER LE FONCTIONMENT DU SOL COMME SYSTEME EPURATEUR), Institut National de la Recherche Agronomique, Versailles (France). Soils Lab.
For primary bibliographic entry see Field 5B.

THE USE OF SOIL AS A PURIFYING SYSTEM (L'UTILISATION DU SOL COMME SYSTEME EDIDATEUR)

EPURATEUR), Institut National de la Recherche Agronomique, Dijon (France). Laboratoire de Microbiologie des Sols.

G. Catroux, J-C. Germon, and P. Graffin. Annales Agronomiques, Vol 25, No 2/3, p 179-193, 1974. 1 fig, 3 tab, 36 ref.

Descriptors: *Waste treatment, *Soil, *Organic matter, *Purification, Aeration, Waste disposal, Filtration, Soil mechanics. Identifiers: Soil mechanics.

Filtration, retention and transmission of water, and aeration and retention of dissolved matter are discussed. The different functions of the soil system in purification are given, stressing the action of microflora and exportation by plants. Means of control in purification by soil are analyzed. Data are compared concerning the purification of waste water by soil and agronomic data on the evolution of organic matter. It was concluded that soil should be capable of purifying about 1,200 kg DCO per hectare per day. Details of the practical uses of soil as a purification system and the disposal of waste water are mentioned. (Prague-FIRL)

THE ECONOMY OF VARIOUS METHODS FOR DEWATERING SLUDGE FROM BIOLOGICAL PURIFICATION (UEBER DIE WIRTSCHAFT-LICHKEIT VERSCHIEDENER VERFAHREN ZUR ENTWAESSERUNG VON BIOLOGISCHEM KLAERSCHLAMM).

Uhde (Friedrich) G.m.b.H., Dortmund (West Germany).

J. Lohmann. Chemie-Ingenieur-Technik, Vol 46, No 20, p 852-856, 1974. 9 fig, 2 ref.

Descriptors: *Sludge treatment, *Dewatering, *Operating costs, *Capital costs, Centrifugation, Filters, *Waste water treatment, Filtration, Biological treatment.

Identifiers: Vacuum filters, Band press.

Sludge from biological purification can be de-watered in several steps and by equipment with varying costs and operating properties. On the basis of experimental results, capital costs, and operating costs, the influence of flocculant consumption on the dewatering costs is examined for vacuum filter, the band press, and the centrifuge. If costs for the various dewatering apparatuses are calculated to include subsequent incineration, they will depend upon whether organic or inorganic flocculants or filtering agents are used for conditioning. For example, if use of an organic flocculant in a centrifuge is followed by a fluidized bed furnace, the costs for the mechanical dewatering stage increase, due to rising flocculant consumption. The decrease of the incineration costs slows down with increasing flocculant consumption. A low cost minimum is obtained at a specific flocculant consumption of 2.9 g/kg dry substance. For the vacuum filter and the filter press no cost minimums exist. The lowest costs are obtained when the minimum filtering agent is required to remove the cake from the filter cloth or the filter press is added. (Nave-FIRL) W75-11127

Group 5D—Waste Treatment Processes

DESIGN CONSIDERATIONS--WATER AND EF-FLUENT DISPOSAL.

Institute of Food Science and Technology, Vol 7, No 2, p 130-137, June 1974.

Descriptors: *Effluents, *Sewers, *Water pollu-*Sludge disposal, Industrial wastes, Rivers, Water quality, Management, Waste water treat-ment, Activated sludge, Domestic sewage. Identifiers: Sewerage Bill of 1968(Scotland).

A Sewerage Bill was introduced into Parliament in 1968, with Part II of the bill concerning trade ef-fluent in accordance with the recommendations of the Hill Watson Committee. According to this act, the local authority is compelled to 'provide public sewers to effectively drain their area domestic sewage, surface water and trade effluent and also provide sewage treatment works to effectively deal with the contents of the sewers'. The local authority has jurisdiction over conditions relating to the sewers into which trade effluent may be discharged: the nature and composition of all trade effluent, maximum quantity and hourly rate, the prohibition of any constituent of any trade effluent which may be detrimental to the operation of the sewers, and the provision of inspection chambers. In regard to water quality control, bacteriological quality, suspended matter, organic matter, dis-solved gases and dissolved solids are the salient headings. Effluent standards are dependent upon the place of the trade effluent discharge. Standards applied to effluents being discharged into rivers are much more strict than the normal limit of less than 20 ppm BOD and 30 ppm suspended solids. More stringent pH and temperature limits are also enforced. Regulations of discharge to tidal waters would be less strict than discharge to tidal river. (Leibowitz-FIRL) W75-11128

DRUG RESISTANT COLIFORMS CALL FOR RE-EVALUATION OF WATER QUALITY STANDARDS.

National Inst. for Water Research, Pretoria (South Africa)

For primary bibliographic entry see Field 5B.

WATER QUALITY CONTROL IN SEWAGE WATER TREATMENT, (IN JAPANESE),

E. Fujimoto, N. Sato, and T. Sekine. Meiden Jiho (Meiden Riview), Vol 5, No 118, p 40-

Descriptors: *Water pollution control, *Waste water treatment, *Sewage treatment, Aeration, In-strumentation, *Model studies, Equations, Biochemical oxygen demand, Water quality con-

To control the operation of sewage treatment plants, mathematical equations are proposed for individual treatment units, such as the sandprecipitation pond, aeration tank, sterilization precipitation pond, aeraton tank, sternization pond, sludge concentration bath, and sludge feed-back system. The model equations reflect the water qualities at each individual unit as well as quantitative conditions appearing at each unit. The equations are to be used by computers to predict better quality, rather than quantity, control in sewage plants. For example, the equation to control air amounts supplied to aeration tanks is expressed as the function of amount of sewage water, oxygen mobility (which is a function of temperature), oxygen dissolution efficiency, BOD ie, MLSS value in aeration tank, and aeration tank capacity. Therefore, to regulate the air amount in the aeration tanks, the measurements of amount of BOD, MLSS values, and dissolved oxygen are all necessary. The use of model equations ygen are all necessary. The use of moder equations for computer quality control will be applicable to sewage plants with future developments in sensoring instrumentation. (Katayama-FIRL) W75-11133 TENSIDS (SYNDETS) AND THE WATER POL-LUTION PROBLEM, (GESUND-HEITLICHE ASPEKTE DES TENSID-GEBRAUCHS), Bundesgesundheitsamt, Berlin (West Germany). Institut fuer Wasser-, Bodenund Lafthygiene.

I. I. Janicke

Fortschritte der Medizin, Vol 93, No 8, p 377-378, March, 1975. 4 ref.

Descriptors: *Waste water treatment, *Surfactants, *Detergents, Domestic wastes, Sewage treatment, Toxicity, Legislation, Foreign research, Environmental effects, Biological treatment, Anaerobic digestion, Water pollution con-

Identifiers: Tensids(Syndets), Germany

Surface active agents in sewage originating mostly from household detergents are an important factor in the determination of environmental influences on man, with special reference to the water supply. The current German legislation on detergents considers the problems in a comprehensive sense including the overall toxicity via and in the water system. The recent literature on toxicological values for warm-blooded animals and aquatic organisms such as sewage degrading bacteria and the influence of chemical structure is discussed. The toxicity of surfactants to a biological sewage treatment system including the effects on anaerobic digestion is considered to be of special importance. Successful control of environmental pol-lution caused by surfactants in the water can be achieved by the use of adequate sewage treatment. (Orr-FIRL)

INTERACTIONS OF HEAVY METALS IN THE ACTIVATED SLUDGE PROCESS,

nois Inst. of Tech., Chicago.

M. H. Cheng. Available from University Microfilms, Inc., Ann Arbor, Michigan, 48106, Order No 74-16992. PhD Thesis, 1973, 221 p.

Descriptors: *Activated sludge, *Heavy metals, *Waste water treatment, *Toxicity, Biological treatment, Sludge, Waste treatment, *Chemical reactions, Ions.

Freundlich equation, Isotherm, Metal ions.

Although many reports on the toxic effects of heavy metals on biological wastes treatment processes have appeared in the literature, little is known about the physical-chemical interactions within the process between the sludge mass and the contraction of the dissolved metal ions. The kinetics of heavy metals uptake by activated sludge, the ability of the sludge to concentrate metal ions from waste water and the affinity of the sludge mass for metal ions were investigated. Metal uptake by the sludge was dependent upon such factors as pH and the con-centrations of sludge, soluble supernatant or-ganics, and metal ions present in the system. Bind-ing capacity appeared to increase with increasing pH, and higher initial concentration of either metal ions or MLSS also augmented the uptake efficiency. If the proper conditions are present the sludge can concentrate heavy metals up to 2 percent or more (by weight) of the sludge mass, even at low initial soluble metal levels. Good correlation was found between the metal uptake by activated sludge and the expression of Freundlich or Lang-muir Isotherm. At high initial metal concentrations, the metal ions precipitate and are entrapped within the biological floc of the activated sludge system. At lower metal concentrations, the metals are taken up by the biomass through other mechanisms, such as physical adsorption, com-plexation and diffusion. (Orr-FIRL) W75-11173

TREATMENT PLANT MONITORING PROGRAMS: A PRELIMINARY ANALYSIS, Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.

P. M. Berthouex, and W. G. Hunter. Journal Water Pollution Control Federation, Vol 47, No 8, p 2143-2156, August 1975. 9 fig, 3 tab, 13 equ, 11 ref.

Descriptors: *Monitoring, *Water pollution control, *Waste water treatment, Costs, Treatment facilities, Decision making, Operations research, Sampling, Standards, Effluents, Behavior, Probability, Data collections, Optimization, Economics, Equations, Statistical models, Systems analysis, Design. Protection.

Identifiers: Control theory, Control charts, Sensitivity, Autocorrelation, Cost minimization.

Statistical monitoring should be used more extensively in pollution control. Monitoring is a prerequisite for control; it is needed to discover ow much control is required or how effective applied controls have been. The design of an effective monitoring system requires balancing the protection purchased against the cost. An approach to this problem is outlined using a simple control chart to determine protection afforded. A simple system behavior/cost model is developed that includes a penalty for polluting as the incentive to purchase protection. Specifically, a compromise between daily treatment plant monitoring and no monitoring is explored. The economic sensitivity of the simple cost function derived from basic control theory is examined to ascertain how much sampling gives a good balance between effluent monitoring cost and assurance of being in compliance with an effluent standard. The statistics used indicate a near optimal sampling interval of 3 or 4 days; this gives a reasonable compromise which provides protection but will not overburden a small operation financially. This analysis provides a framework that small plants (where often the cost-benefit relationship is unclear) and regula-tory agencies may use to consider rationally the motivation for and implementation of enforcement programs. (Bell-Cornell) W75-11176

DISTRIBUTION-SYSTEM OPERATION ANAL-

YSIS MODEL, Omaha Metropolitan Utilities District, Nebr. Ser-

vices Dept. J. L. Gerlt, and G. F. Haddix.

Journal of the American Water Works Associa-tion, Vol 67, No 7, p 381-384, July 1975. 5 fig, 2 ref.

Descriptors: *Water distribution(Applied). Descriptors: Water distribution of the Constraints, Equations, Optimization, Simulation analysis, Computer programs, Water treatment, Operating costs, Pumping, Storage, Pressure, Water demand, Networks, Energy, Mathematical models, Systems analysis, Model studies,

Water demand, vetworks, Liergy, Model studies, "Distribution systems, "Nebraska. Identifiers: "Omaha(Neb), "Systems operational analysis model, "Mixed integer programming, Hardy Cross method, Cost minimization, Cost minimization, Description of the Cost minimization, Cost minimi MAGEN computer language, Power, Electrical

pe sh de ha ba hy Ci th

SO OF W. Mi Fo. Fo. W.

In 1970, Omaha, Nebraska recognized the need for more efficient methods to operate and expand its water treatment and distribution system. As part of a comprehensive master plan, a systems opera-tional analysis model (SOAM) of the district's treatment, pumping, and storage facilities was developed. This article presents a highly descrip-tive account of the model and its procedural application to the Omaha system. SOAM, designed to be used in conjunction with an advanced compu-terized Hardy Cross-type flow simulation model. employs mixed-integer optimization techniques and is utilized to derive least-cost combined treatment plant, pump-station, and storage-operation strategies. A simplified network for the Omaha municipal water system (MUD) is developed that is suited to analysis using the Hardy Cross program. Considered in detail are the defining equations and constraints for the system. Described are the network nodes, problem parameters, solution variables, system defining equations, energy and power equations, cost equations, and other constaints. The minimization problem is solved using a three-module process: (1) an equation-constraint generation program using the MAGEN matrix generation language solves the (2) minimization problem for several water-use-demand profiles, and (3) a well-designed, easily read report of the second module is derived. It is concluded that the district's operating policies are nearly optimal for the current distribution system. (Bell-Cornell)

SIMULATION OF WATER QUALITY MANAGEMENT POLICIES, Virginia State Water Control Board, Richmond. QUALITY

For primary bibliographic entry see Field 5G. W75-11181

BARK AS TRICKLING-FILTER DEWATERING MEDIUM FOR PULP AND PAPER MILL

Georgia Inst. of Tech., Atlanta. Dept. of Chemical Engineering

G. R. Lightsey.

Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as PB-244 820, 33.75 in paper copy, \$2.25 in microfiche. Georgia Environmental Resources Center, Atlan-ta, Report No ERC-0975, July 1975, 21 p, 6 fig. 5 tab, 16 ref, append. OWRT A-059-GA(1) 14-31-001-5010

Descriptors: "Waste water treatment, "Sludge disposal, "Trickling filters, "Pulp wastes, Nitrogen, Filtration, "Dewatering, "Sludge treat-ment, Industrial wastes, Chemical oxygen de-mand, Biochemical oxygen demand, Soil treat-

Identifiers: *Sludge drying, Bark utilization, Pine

Waste water treatment methods are of considerable importance to the pulp and paper industry to achieve prescribed environmental standards at a reasonable cost. Pine bark, an abundant manufacturing residue, is examined for its effectiveness for use first as a trickling filter medium and then as toruse tirst as a tricking fluter medium and then as a soil amendment. Three trickling fluter models were examined for their ability to remove BOD, COD, sodium, settleable matter, and color from a primary sludge stream from a clarifier. Conductivity and pH observations were recorded. Results ate that pine bark as a filter medium is very effective in removing settleable matter from a pri-mary sludge and BOD from the liquid fraction The settlable matter is converted to a dewatered sludge at the filter face and BOD removal in the liquid is up to 95 percent. Blinding of the filter can be a problem if the dewatered sludge is not periodically removed. Experimental observations show that the BOD and COD removal efficiencies do not further change significantly after the liquid has passed through approximately three feet of the bark medium. The results suggest the optimum hydraulic loading rate for maximizing BOD and COD removal and minimizing filter size is larger than the maximum 4.59 gals. Ft-2day-1 rate tested in this study. Maximum BOD and COD removal were 95 and 42 percent, respectively, for the highest dosing rate. The nitrogen content of the pine bark medium significantly increases after aproximately two months use as a filter mediu proximately two months use as a litter medium. The strongly indicates that bark, after use as a trickling-filter medium, would have far greater value as a soil conditioner than raw bark. W75-11241

CHANGES IN VEGETATION AND SURFACE SOIL PROPERTIES FOLLOWING IRRIGATION OF WOODLANDS WITH MUNICIPAL WASTE-WATER

Michigan State Univ., East Lansing. Dept. of

For primary bibliographic entry see Field 5B. W75-11243

TIME-VARIANT CHARACTERISTICS SELECTED WASTEWATER PLANTS OF NEVADA, TREATMENT

Nevada Univ., Reno. Desert Research Inst. .. Gupta

Available from the National Technical Informa tion Service, Springfield, Va. 22161, as PB-244 822, \$3.75 in paper copy, \$2.25 in microfiche. Center for Water Resources Research, Reno, Project Report No 36, August 1975. 38 p, 14 fig, 6 tab, 11 ref. OWRT A-049-NEV(2), 14-31-0001-3838.

Descriptors: *Waste water treatment, Water quality control, *Treatment facilities, *Statistical methods, *Temporal distribution, *Distribution patterns, Probability.
Identifiers: Spectral analysis.

Six wastewater treatment plants in Nevada were analyzed for resultant effects on receiving water body quality caused by temporal variability of sewage effluent quality. The variation of the peak hourly flows caused by population was examined with efforts to develop an empirical equation usable for future planning of sewage collection works. The probability distributions of a variety of variables such as hourly influent flow, daily flow, influent and effluent biochemical oxygen demand and suspended solids, and in some instances, phosphate concentrations, were investigated. Results showed the significance of expressing treatment effectiveness in terms of statistical parameters rather than average values only. The study also revealed periodicities exist in a multitude of variables associated with the municipal wastewater treatment facilities. Engineering and scientific principles rather than purely empirical considerations should govern the design and operation of plant facilities. (Fallon-Nevada) W75-11245

STATUS OF WASTE HEAT UTILIZATION AND DUAL-PURPOSE PLANT PROJECTS,

For primary bibliographic entry see Field 3E. W75-11251

WASTE WATER SURVEY, ST. REGIS PAPER COMPANY, CANTONMENT, FLORIDA.

Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
Available from the National Technical Informa-

tion Service, Springfield, Va 22161 as PB-228 275, \$4.25 in paper copy, \$2.25 in microfiche. August 1972. 52 p, 4 fig, 4 ref, 14 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, *Evaluation, Water pollution sources, Wastes, Industrial wastes, pollution sources, wastes, industrial wastes, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Lignins, Color, *Florida, Ammonia, Phosphorus compounds, Nutrients, Settling basins, Aerated lagoons, Sewage treatment, Nutrient removal, Water pollu-Water pollution control, Waste tion treatment, water(Pollution)

Matericondunia Identifiers: Total organic carbon, Kraft mills, Phosphoric acid, Perdido Bay(Fla), Elevenmile Creek(Fla), Bleached paper, Kraft paper, Perdido Bay Federal-State Enforcement Conference.

An evaluation is presented of waste treatment at St. Regis Paper Company's integrated kraft pulp and paper mill located at Cantonment, Florida. Reported results are from a 1972 study which was requested by the conferees at the Perdido Bay Federal-State Enforcement Conference Progress Meeting held in Gulf Breeze, Florida, during January, 1972. The field study was designed to determine the waste removal effectiveness of the mill's waste treatment facilities and to characterize the wastes discharged. Daily production during the survey averaged 830 tons of kraft pulp (543 tons of unbleached and 287 tons of bleached) and 785 tons of bleached and unbleached paper. Approximately 29 million gal/day of liquid wastes

generated at the mill are discharged into Perdido Bay via Elevenmile Creek. The treatment facilities include a primary settling basin, nutrient feed system (anhydrous ammonia and phosphoric acid), three aeration ponds, and a final settling pond. Riffle terraces are located before and after the final pond. Waste loads and concentrations before and after treatment and percent reductions are as follows: BOD, 45,000 lb/day (210 mg/liter) and 4,050 lb/day (17 mg/liter), 91%; total organic and 4,030 10/day (17 mg/niter), 91%; total organic carbon, 57,500 lb/day (264 mg/liter) and 29,300 lb/day (122 mg/liter), 49%; COD, 175,000 lb/day (814 mg/liter) and 83,400 lb/day (352 mg/liter), 52%; lignin-like compounds, 19,600 lb/day (91 mg/liter) and 17,300 lb/day (73 mg/liter), 12%; and color (Pt-Co units), 1,290 mg/liter and 1,100 mg/liter, 15%. About 90% of the total suspended solids load (49,200 lb/day) and total volatile suspended solids (30,000 lb/day) are removed in the treatment system. All of the N and P added by the nutrient feed system was not assimilated. W75-11314

VACUUM DISTILLATION/VAPOR FILTRA-TION WATER RECOVERY.

General American Transportation Corp., Niles, Ill. R. J. Honegger, R. B. Neveril, and G. A. Remus. Available from the National Technical Information Service, Springfield, Va 22161 as NASA-CR-120303, \$3.75 in paper copy, \$2.25 in microfiche. Summary Report for Phase III. April 1974. 40 p, 14 fig, 2 tab. Project No 1528. NAS 8-27467.

Descriptors: *Distillation, *Urine, *Water reuse, Potable water, Wastes, *Waste water treatment, Condensation, Water vapor, Gravity, Testing, Liquid wastes, Liquids, Equipment, *Filtration, Domestic wastes. Identifiers: Human wastes, *Vacuum systems,

Space technology.

Research activities preparatory to conducting lowgravity tests of a vacuum distillation/vapor filtra-tion (VD/VF) system for recovering water from urine and humidity condensate are described. The VD/VF system comprises an evaporator, catalytic oxidation unit, and condenser, as well as auxilliary heat exchangers, valves, pumps, and controls. The evaporator boils urine and condensate into raw vapor, the catalytic oxidation unit removes organic contaminants and bacteria from the vapor, and the condenser condenses the vapor into pota-ble water. A schematic flow diagram of the VD/VF system is given. Preparations for low-gravity testing described include analysis of liquid gravity testing described include analysis of indumotion inside the evaporator during parabolic flights; installation of a transparent top on the evaporator and liquid deflectors within the evaporator; design of supports for VD/VF system components; design of a cooling unit; modification of various components, including sludge removal pump, drive motor and speed reducer for evaporator impeller, and oil-less vacuum pump; and frame fabrication and system assembly. The present status of low-gravity test preparations is assessed. W75-11315

CONSIDERATIONS FOR PREPARATION OF OPERATION AND MAINTENANCE MANUALS, Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
R. L. Green, G. L. Page, Jr., and W. M. Johnson.
Available Supt. of Doc., GPO, Washington, D.C.

\$2.85. EPA Report 430/9-74-001, 1973, 239 p, 21 fig, 80 ref, 2 tab. 68-01-0341.

Descriptors: *Treatment facilities, *Operation and maintenance, *Publications, Cities, *Waste water treatment, Maintenance, Equipment, Operations, Permits, Water quality standards, Sludge treatment, Personnel, Laboratory tests, Logging(Recording), Safety, Utilities, Electrical equipment, Pumping plants, Pipelines. Identifiers: Emergency operation.

Group 5D—Waste Treatment Processes

The preparation of municipal waste water treat-ment plant operation and maintenance manuals is discussed. The type of information to be included in each of the recommended chapters is described. The latter include: an introduction; discharge permits and water quality standards; description, operation, and control of waste water treatment facilities; description, operation, and control of sludge handling facilities; personnel requirements; laboratory testing; records; maintenance; emergency operating and response program; safety; utilities; and electrical system. Suggested manual outlines have been prepared for treatment plants and for pumping stations and pipelines. (Witt-IPC) W75-11317

UPGRADING MEAT PACKING FACILITIES TO REDUCE POLLUTION. (PART 1), IN-PROCESS MODIFICATIONS AND PRETREATMENT, Environmental Protection Agency, Washington,

D.C. Technology Transfer Staff.

A. J. Steffen.

EPA Technology Transfer Seminar Publication, No. 1, Oct. 1973. 90 p, 23 fig, 9 tab, 18 ref, 2 append.

Descriptors: *Food processing industry, *Waste water treatment, *Industrial wastes, Pollution abatement, Water pollution treatment, Waste treatment, Treatment facilities, Odor. Identifiers: *Meat packing industry.

This text, designed for owners, managers, superintendents, and operators of meat packing plants, deals with in-plant modifications for pollution abatement, including odor control, and pretreatment of waste waters prior to discharge to municipal sewage lines. Case histories are given. (See also W75-11321 and W75-11322) (Brown-IPC) W75-11320

UPGRADING MEAT PACKING FACILITIES TO REDUCE POLLUTION. (PART 2). WASTE TREATMENT.

Bell, Galyardt and Wells, Omaha, Nebr. W. J. Wells, Jr., P. B. Wells, C. A. Haas, S. L. Hergert, and S. J. Brown. EPA Technology Transfer Seminar Publication, No. 2, Oct. 1973. 64 p, 35 fig, 7 tab.

Descriptors: *Waste water treatment, processing industry, Treatment facilities, Planning, Waste treatment, Pollution abatement, Water pollution treatment, *Industrial wastes, Water pollution sources. Identifiers: *Meat packing industry.

The 7 chapters of this text deal with the need for wastewater treatment, the role of microorganisms, waste loads from meat packing factories, planning and design procedures for treatment facilities, treatment methods (anaerobic, aerobic lagoon, activated sludge, trickling filter, rotating biological disk, and irrigation), and maintenance and operation of waste treatment plants. Case histories and a survey of existing treatment facilities in the meatprocessing industry are also given. (See also W75-11320 and W75-11322) (Brown-IPC) W75-11321

UPGRADING MEAT PACKING FACILITIES TO REDUCE POLLUTION. (PART 3). CHOOSING THE OPTIMUM FINANCIAL STRATEGY,

Commins (J. A.) and Associates, Inc., Fort Washington, Pa.

U. M. Patankar, and C. R. Marshall. EPA Technology Transfer Seminar Publication, No. 3, Oct. 1973. 38 p, 10 fig, 6 tab.

Descriptors: *Food processing industry, *Waste water treatment, *Economics, Costs, *Financing, *Optimization, Pollution abatement, Water pollution treatment, Waste treatment, *Industrial wastes, Treatment facilities, Operation and maintenance, Capital cost, Depreciation, Decision Identifiers: *Meat packing industry.

Detail topics discussed in the 7 chapters of this text include depreciation, financing strategies for pollution-control investments, state financing and tax incentives, and financial decisionmaking theory for municipal vs. private facilities. An illustration of optimizing financial strategy for pollu-tion control is included. (See also W75-11320 and W75-11321) (Brown-IPC) W75-11322

POLLUTION ABATEMENT IN A BREWING FACILITY.

Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.

EPA Technology Transfer Capsule Report No. 6, (1974). 17 p, 8 fig, 6 tab.

Descriptors: *Waste water treatment, *Treatment facilities, Biochemical oxygen demand, Suspended solids, Wastes, Industrial wastes, Water pollution sources, Water pollution treat-ment, Water pollution control, Capital costs, Operating costs, Costs, Water conservation, Byproducts, Sludge, *Colorado, Sewage treat-ment, Neutralization, Waste treatment, Activated sludge, Biological treatment, Food processing in-

Identifiers: *Brewing industry, Hatfield process.

The brewing process and waste water treatment at Adolph Coors Company (Golden, Colorado) are described. Wastes generated from the combined brewing and malting operations amount to 3.3 million gal/day at a BOD level of 825 mg/liter. This is less than one-half the waste load produced by average breweries without malting facilities. The waste treatment facility provides primary treatment through neutralization and solids removal, and secondary treatment through a high-rate ac-tivated sludge system using a modification of the Hatfield process. Suspended solids are reduced by 90%, from 280 mg/liter to 29 mg/liter, and BOD is reduced by 96% to 34 mg/liter. Coors has realized sizable savings in the capital and operating costs for its waste treatment facility by reducing the raw wastes from the brewing plant through a program of water conservation, in-plant waste reduction, and recovery of waste materials as by-products. Preliminary feeding tests have shown that the dried sludge can be used as a high protein animal feed supplement. (Witt-IPC) W75-11323

UPGRADING METAL-FINISHING FACILITIES TO REDUCE POLLUTION. (PART 1). IN-PROCESS POLLUTION ABATEMENT,

Oxy Metal Finishing Corp., Madison Heights, Mich. A. E. Olsen, and E. N. Hanf.

EPA Technology Transfer Seminar Publication, No. 1, July 1973. 69 p, 32 fig, 4 tab, 14 ref, 2 ap-

Descriptors: *Metals, *Chemical wastes, *Waste water treatment, *Water pollution treatment, *Pollution abatement, Water pollution sources, Corrosion control, Equipment, *Industrial wastes, Effluents, Ventilation, Air pollution.
Identifiers: *Metal finishing wastes.

The 3 chapters of this text deal with water and air pollution control measures and devices, as well as with corrosion protection of floors and equipment in various types of metal-finishing plants. Case histories and examples are included. (See also W75-11325) (Brown-IPC) W75-11324

UPGRADING METAL-FINISHING FACILITIES TO REDUCE POLLUTION. (PART 2). WASTE

Lancy Labs., Inc., Zelienople, Pa. L. E. Lancy, and R. L. Rice.

EPA Technology Transfer Seminar Publication, No. 2, July 1973, 47 p, 24 fig, 2 tab, 40 ref.

Descriptors: *Metals, *Waste water treatment, *Pollution abatement, *Chemical wastes, *Water pollution treatment, Water pollution sources, Economics, Sludge disposal, Sludge treatment, Dewatering, Separation techniques, Ion exchange, Reverse osmosis, Evaporation, Industrial wastes. Identifiers: Chemical recovery, *Metal finishing

Metal-finishing processes requiring pollution control are discussed, along with commonly used waste-treatment systems (batch, continuous, and integrated). The regeneration of process solutions and metal recovery (by evaporation, ionexchange, and reverse osmosis) are dealt with in detail, including economic considerations. The final chapter considers solid-liquid separation, disposal. (See also W75-11324) (Brown-IPC)

UPGRADING TEXTILE OPERATIONS TO REDUCE POLLUTION. (PART 1). IN-PLANT CONTROL OF POLLUTION.

Institute of Textile Technology, Charlottesville,

EPA Technology Transfer Seminar Publication, EPA-625/3-74-004, No. 1, Oct. 1974. 118 p, 14 fig, 50 tab, 28 ref, 2 append.

Descriptors: *Pollution abatement, *Waste water treatment, *Textiles, Chemical wastes, Air pollution, Water pollution sources, Industrial water, Monitoring, Data collections, Water reuse, Flow control, Water supply, Foaming, Identifiers: "Textile industry wastes.

Current practices in the technology of waste water management (waste survey, major sources of pol-lution, and flow reduction) are discussed, along with air pollution abatement (emissions survey, particulate control, and solvent recovery) in the textile industry. Some of the details dealt with include pretreatment of textile wastes prior to discharge, case histories of flow reduction and water reuse, substitution of processes and materials and their effects on pollution abatement, and the reduction of wastewater foaming. (See also W75-11327) (Brown-IPC) W75-11326

UPGRADING TEXTILE OPERATIONS TO REDUCE POLLUTION. (PART 2), WASTE-WATER TREATMENT SYSTEMS.

Metcalf and Eddy, Inc., Boston, Mass. EPA Technology Transfer Seminar Publication, EPA-625/3-74-004, No. 2, Oct. 1974. 45 p, 10 fig, 16 tab. 4 ref.

Descriptors: *Textiles, *Waste water treatment, *Chemical wastes, Pollution abatement, Water pollution treatment, Activated carbon, Biological Identifiers: *Textile industry wastes.

The 5 chapters of this text discuss the need for textile industry wastewater treatment, sources and strengths of these wastewaters, biological treatment methods, and granular activated carbon treatment. Case histories are also cited. (See also W75-11326) (Brown-IPC) W75-11327

UPGRADING POULTRY-PROCESSING FACILI-TIES TO REDUCE POLLUTION. (PART 1). IN-

PROCESS POLLUTION ABATEMENT, Environmental Engineering, Inc., Gainesville, Fla. R. H. Jones, J. D. Crane, T. A. Bursztynsky, and J. A. Macon.

EPA Technology Transfer Seminar Publication, No. 1, July 1973. 28 p, 1 fig, 5 tab, 6 ref.

Descriptors: *Food processing industry, *Poultry, *Waste water(Pollution), *Water management(Applied), Industrial water, Equipment, Pollution abatement, Waste water treatment, Water supply, Industrial wastes.
Identifiers: *Poultry processing wastes.

The supply and management of poultry-processing water is discussed, including a case history and practical recommendations for waste water control and equipment changes. (See also W75-11329 and W75-11330) (Brown-IPC) W75-11328

UPGRADING POULTRY-PROCESSING FACILITIES TO REDUCE POLLUTION. (PART 2). PRETREATMENT OF POULTRY-PROCESSING

Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.

A. J. Steffen.

EPA Technology Transfer Seminar Publication, No. 2, July 1973. 54 p., 22 fig, 3 tab, 13 ref.

Descriptors: *Poultry, *Food processing industry, *Waste water treatment. *Industrial wastes. Pollu-Regulation, Legislation, abatement, Economics, Costs.
Identifiers: *Poultry processing wastes.

The 5 chapters of this discussion examine conditions for the pretreatment of poultry-processing wastewater prior to discharge into a municipal sewage system (e.g., for legal reasons and/or to economize on final treatment costs), as well as the type of pretreatment to be selected (none, secondary screening, solids separation, and/or biological or chemical treatment) and factors to be considered in the decision. (See also W75-11328 and W75-11330) (Brown-IPC) W75-11329

UPGRADING POULTRY-PROCESSING FACILI-TIES TO REDUCE POLLUTION. (PART 3).

WASTE TREATMENT.
Giffels Associates, Inc., Detroit, Mich.
EPA Technology Transfer Seminar Publication,
No. 3, July 1973. 48 p., 24 fig., 5 tab.

Descriptors: *Treatment facilities, *Food processing industry, *Poultry, Waste water treatment, Water pollution treatment, Pollution control, Water pollution sources, Costs. Identifiers: *Poultry processing wastes.

Reasons and planning for waste water treatment in poultry-processing plants, the operation of treatment systems, and a case history are discussed, including site selection, waste water surveys, process selection, design criteria, expansion provisions, system costs, operating difficulties, and proposed modifications. (See also W75-11328 and W75-11329) (Brown-IPC) W75-11330

EFFLUENT CHARACTERISTICS AND TREAT-MENT OF MECHANICAL PULPING EF-FLUENTS,

B.C. Research, Vancouver(British Columbia). T. E. Howard, and C. C. Walden.

International Mechanical Pulping Conference, San Francisco, June 16-20, 1975, (Preprinted Proceedings, TAPPI, Atlanta, Ga.), p 197-201. 1 fig, 4 ref, 4 tab.

Descriptors: *Pulp wastes, *Biochemical oxygen demand, *Toxicity, *Fish, Rainbow trout, Indus-trial wastes, Wastes, Water pollution sources, Water pollution effects, Water pollution, Aerobic treatment, Activated sludge, Waste water treatment, Flocculation, Waste treatment, Water pollution control, Lagoons, Economics.
Identifiers: *Mechanical pulping, *Total organic

This study assessed the 5-day BOD, total organic carbon, and toxicity to fish of mechanical pulping effluents where the effluent is not contaminated by barking wastes or brightening aids. The raw effluent was toxic to rainbow trout with the median tolerance limit, 96 hr-LC(50), normally between 4-10% (volume/volume) and the median survival time in 65% concentration frequently as low as 20 minutes. The BOD ranged from 300 to 1400 mg/liter and the total organic carbon was about 400 mg/liter. Aerobic microbiological fermentation either in activated systems or in 5-day lagoon systems reduced the BOD by as much as 97% and total organic carbon correspondingly. All systems effectively detoxified the waste unless activity was limited by temperature, as in the case of a system operated at 1 C. Flocculation was not effective. The economics of treatment are discussed briefly as are the interrelationships of effluent characteristics. The only useful relation hip was between 5-day BOD and total organic carbon. (See also W75-11332) (Witt-IPC) W75-11331

MILL EXPERIENCE IN THE TREATMENT OF MECHANICAL PULPING EFFLUENT,

B.C. Research, Vancouver (British Columbia). T. E. Howard, R. G. Leslie, and N. E. Ward. International Mechanical Pulping Conference, San Francisco, June 16-20, 1975 (Preprinted Proceedings, TAPPI, Atlanta, Ga.), p 202. 1 fig. 1

Descriptors: *Pulp wastes, *Waste water treatment, *Aerobic treatment, *Biological treatment, Lagoons, Oxidation ponds, Biochemical oxygen demand, Toxicity, Winter, Seasonal, Heating, Natural gas, Temperature control, Industrial wastes, Wastes, Water pollution sources, Water pollution treatment, Water pollution control, Foreign countries, Canada.

Identifiers: *Mechanical pulping, Finlay Forest Industries Ltd.(Canada)

dustries Ltd.(Canada).

Refiner-groundwood pulping effluent at Finlay Forest Industries Ltd. (Mackenzie, British Columbia) is treated by an aerobic microbiological system (consisting of a primary lagoon, 3-day aerated stabilization basin, and final aeration learners) to reduce ROD and remove to recitive. lagoon) to reduce BOD and remove toxicity. Detoxification of the effluent during winter months (November-February) has been improved by installing submerged natural gas heaters ahead of the 3-day lagoon to maintain the temperature of the effluent around 18 C. (See also W75-11331) (Witt-IPC) W75-11332

PAPERMAKING COMPLEX AT DUNAUJ-VAROS (HUNGARY) -- PRESERVING THE DANUBE (AU COMPLEXE PAPETIER DE DU-NAUJVAROS -- PRESERVER LE DANUBE),

Ripinvest, Budapest (Hungary).
P. Gati, and C. Maric.
Papier, Carbon et Cellulose, Vol 24, No 5, p 42-47, May, 1975. 1 fig, 4 illus, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, Industrial wastes, Wastes, Water pollution sources, Biological treatment, Water purification, Sludge treatment, De-watering, Filtration, Aeration, Water pollution treatment, Water pollution control, Europe, Pulp

and paper industry.

Identifiers: *Hungary, Corn stalks, Kraft mills,
Groundwood mills, Writing papers, Printing

The pulp and paper complex at Dunaujvaros includes a 22,000 ton/year kraft pulp mill processing corn stalks, a 15,000 ton/year groundwood mill, and a 70,000 ton/year writing and printing paper mill. Plans call for the installation of a semichemical pulp mill, a linerboard and corrugating medium machine, and a box plant in 1976. Internal measures for reducing pollution at the complex are outlined, including the planned chemical cross-recovery system. A description is presented of the effluent treatment system being developed, which includes physical-chemical clarification plus biological purification (activated sludge aeration plus secondary clarification). Sludge thickening and filtration procedures are also mentioned. (Speckhard-IPC) W75-11333

SOLUTE-SOLUTE INTERACTIONS IN ULTRAFILTRATION TREATMENT OF PAPER MILL WASTES,

North Carolina State Univ., Raleigh. Dept. of

Chemical Engineering.
H. B. Hopfenberg, V. T. Stannett, and M. W.

American Institute of Chemical Engineers, Symposium Series, Vol 70, No 139, p 1-10, 1974. 14 fig, 22 ref, 1 tab.

Descriptors: *Waste water treatment, *Reverse osmosis, *Inorganic compounds, Industrial wastes, Wastes, Water pollution sources, Membrane processes, Separation techniques, Waste treatment, Membranes, Water pollution treatment, Water pollution control, Electrolytes, Gels, Permselective membranes.

Identifiers: *White water, *Starch, Cellulose

acetate membrane.

The effect of interactions between starch and various inorganic salts on flux-limiting phenomena in the ultrafiltration of salt-starch-water solutions was studied. These ternary solutions were formulated to model a paper mill white water and contained a commercial papermaker's oxidized starch and one of several salts (sodium chloride, sodium sulfate, magnesium chloride, magnesium sulfate, aluminum chloride, or aluminum sulfate). The test loop employed an Eastman Chemicals KP-90 asymmetric cellulose acetate membrane. The results showed a reduction in product flux of up to 70% from the pure water flux when a starch-salt solution was treated, indicating that process equipment may be undersized by a factor of 4 if these flux-limiting interactions between solutes are ignored. In an aqueous solution of oxidized starch, the starch chain is in an expanded configuration, due to repulsion of like charges from the ionized COOH groups along the chain. By adding an electrolyte, the charges on the chain are shielded by the counterions, allowing the polymer chain to coil more densely. The shielded starch molecules form less viscous solution and, ultimately, a denser gel than they would without shielding. Gel formation on the membrane surface caused by the preferential accumulation of starch at the solutionmembrane interface adds an additional resistance to water transport through the membrane. The interaction between starch and salt is a consequence of the charge on the polymer, and the resistance to water transport was shown to increase with increasing concentration of starch and/or salt and with decreasing charge frequency on the starch molecule. (Witt-IPC) W75-11334

EVALUATION OF THE ADSORPTIVE PRO-PERTIES OF FLY ASH WITH REFERENCE TO A PULP AND PAPER MILL WASTE EF-FLUENT,

National Council of the Paper Industry for Air and Stream Improvement, Inc., New York. R. C. Whittemore.

U.S. Bureau of Mines, Information Circular IC 8640, p 296-317, 1974. 50 ref, 14 tab.

Descriptors: *Fly ash, *Bleaching wastes, *Color, Waste water treatment, Biochemical oxygen demand, Chemical oxygen demand, Wood wastes, Bark, Water pollution sources, Wastes, *Industrial wastes, Water pollution treatment, Water pollution control, Lime, *Waste treatment.

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

The adsorptive properties of fly ash from boilers that burned wood wastes and bark along with auxiliary fuels (oil and gas), from a coal-burning boiler, and from coal- and bark-fired boilers were studied. The results showed that the fly ash in general did not have conventional adsorptive properties comparable to a commerical-grade ac-tivated carbon. Softwood-bark-derived fly ash adsorbed iodine and phenol better than the hardwood-bark-derived fly ash. The study also in-dicated that the ability of a fly ash to be used ef-fectively in the treatment of a particular pulp and paper mill waste was proportional to its lime (CaO) content. Hardwood bark fly ash had a high lime content and was most effective in removing caustic bleaching effluent color, COD, and 5-day ROD (Witt-IPC) W75-11335

OBSERVATIONS CONCERNING PREPARATION AND STORAGE OF STREAM REPARATION AND STORAGE OF STREAM
SAMPLES FOR DISSOLVED INORGANIC
PHOSPHATE ANALYSIS,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.

WORKSHOP ON COMPUTER-AIDED DESIGN AND SIMULATION OF WASTE TREATMENT

Environmental Protection Service, (Ontario). Water Pollution Control Directorate.

Department of the Environment, Report No. (Training Manual) EPS 6-WP-74-1, January, 1974,

Descriptors: *Waste water treatment, *Treatment facilities, *Design, *Model studies, *Computer models, Computer programs, Mathematical models, Sanitary engineering, Sewage treatment, Water pollution treatment, Water pollution control, Waste treatment.

This volume contains the notes from a workshop conducted for Environmental Canada by B and F Silveston, Engineers (Kitchener, Ontario) in January, 1974, on the application of computers in waste treatment plant design and planning studies The individual chapters cover the objectives and organization of the workshop, usefulness of computers in process design and simulation, process systems analysis, the SEPSIM (Short Executive Program for SIMulation) software, model development, and mathematical models for a wide variety of waste treatment processes. An appendix describes the applications and operation of the SEPSIM program. (Witt-IPC)

MEASURES IN THE SULFITE PULP INDUSTRY FOR DECREASING WASTE WATER LOAD (MASSNAHMEN DER SULFITZELLSTOFF-IN-DUSTRIE ZUR MINDERUNG DER ABWASSER-BELASTUNG).

Chemiefaser Lenzing A.G. (Austria). R. Hornke, and H. Danninger. Das Papier, Vol 29, No 6, p 241-245, June, 1975. 5 fig, 3 ref, 1 tab.

Descriptors: *Pulp and paper industry, *Waste water treatment, *Water pollution, Sulfite liquors, Bleaching wastes, Industrial wastes, Wastes, Water pollution sources, Neuralization, Biological treatment, Biochemical oxygen demand, Water Water State Water St pollution control, Water pollution treatment.
Identifiers: Chemiefaser Lenzing AG.(Austria),
Austria, Evaporator condensates, Sulfite mills.

Following a short review of the origins of waste water loads during the operation of a sulfite pulp mill, measures being taken or planned at the mill of Chemicfaser Lenzing AG. (Austria) are described. A differentiation is made between measures for digester discharge, condensates from spent liquor evaporation, and bleach plant effluents. The target

is a spent liquor retention of 99.3%, neutralization of evaporator condensates, and treatment of the bleaching waste water in a biological or other decomposition stage, with the desired result of a total discharge of only 6 tons or 5-day BOD per day. (Speckhard-IPC) W75-11339

EFFECT OF LIME TREATMENT ON MOLECULAR WEIGHT DISTRIBUTION OF COLOR BODIES FROM KRAFT LINERBOARD DECKER EFFLUENTS, Institute of Paper Chemistry, Appleton, Wis. H. S. Dugal, J.-W. Swanson, E. E. Dickey, and M.

A. Buchanan. Tappi, Vol 58, No 7, p 132-135, July, 1975. 4 fig, 12

Descriptors: *Pulp wastes, *Lime, *Color, *Waste water treatment, Industrial wastes, Wastes, Water pollution sources, Water pollution treatment, Waste treatment, Effluents, Solubility, Pulp and paper industry, Freeze drying.
Identifiers: *Molecular weight, Decker effluents,

Kraft linerboard, Total organic carbon, Sugars,

Concentrated aqueous solutions of freeze-dried solids from kraft linerboard decker effluents (before and after lime treatment) were acidified to give acid-insoluble and acid-soluble fractions in experiments designed to allow the isolation and characterization of the colored components of dilute kraft waste liquors. About 63% color was obtained as an acid-insoluble fraction when the effluent not treated with lime was acidified, and only 26% when lime-treated effluent was acidified. Lime treatment removed approximately 86% of the color, 57% of the total organic carbon, and 17% of the reducing sugars from the decker ef-fluent. Apparent weight-average molecular weights of the acid-insoluble color bodies before lime treatment varied from less than 400 to 30,000 and after lime treatment from less than 400 to 5.000. Acid-soluble color bodies, before and after lime treatment, ranged from less than 400 to 5,000. Color bodies having a weight-average molecular weight of less than 400 were not removed by lime treatment, and those above 5,000 were completely removed. Color bodies in the intermediate range (weight-average molecular weight 400-5,000) were apparently partially removed. (Sykes-IPC) W75-11345

BIODEGRADATION OF COMPONENTS OF PULP WASTE EFFLUENTS BY BACTERIA. (1). DEGRADATION OF KRAFT LIGNIN (IN

For primary bibliographic entry see Field 5B. W75-11346 Nagoya Univ. (Japan). Faculty of Agriculture.

TREATING EFFLUENTS FROM A SULPHITE PULP MILL BY FLOTATION, Ahlstrom (A.) Osakeyhtio, Varkaus (Finland).

Paper and Pulp Div. G. Norrman, and B. Myreen.

Paperi ja Puu, Vol 57, Special issue No 4a, p 177-179, 181-182, April, 1975. 5 fig, 6 ref, 1 tab.

Descriptors: *Sulfite liquors, *Flocculation, *Waste water treatment, *Flotation, Industrial wastes, Wastes, Water pollution sources, Waste treatment, Water purification, Water pollution control, Efficiencies, Effluents, Regression analysis, Europe, Pulp and paper in-

Identifiers: Sodium aluminate, Polyacrylamide, Polyamide-amine, Sulfite pulp mills, Finland.

Effluents from a Finnish calcium-base sulfite mill were subjected to purification by chemical flota-tion. The effects of different flocculants (sodium aluminate, polyacrylamide, polyamide-amine) and other variables (water pH, air content, surface loading, retention tank pressure, coagulant dosage) on the efficiency of the flotation plant were analyzed by regression techniques. Type of flocculant was found to have the greatest effect. Best results under the particular operating condi-tions of this installation were obtained with polyacrylamide. Sodium aluminate was better than no flocculant, but was sensitive to pH variations and required a high retention tank pressure. The polyamide-amine used was not particularly effective. (Brown-IPC)

STUDY OF ELECTROCHEMICAL TREAT-MENT METHOD FOR REMOVING COL-LOIDAL PARTICLES FROM PULP AND PAPER INDUSTRY EFFLUENTS (TUTKIMUS SELLU-TEOLLISUUDEN JATEVESIEN KOL-LOIDAALISTEN AINESTEN POISTOMAHDOL-LISUUDESTA SAHKOKEMIALLIESTI), Helsinki University of Technology, Otaniemi (Finland). Dept. of Metallurgy.

P. J. Tunturi.

Paperi ja Puu, Vol 57, Special Issue No 4a, p 235-238, 241-244, April, 1975. 6 fig, 11 ref, 5 tab. English summary.

*Waste treatment. Descriptors: water *Electrochemistry, *Colloids, Industrial waste, Pulp and paper industry, Wastes, Water pollution sources, Waste treatment, *Flocculation, Water purification, Suspended solids, Neutralization, Stabilization, Electric fields, Anodes, Corrosion control, Corrosion, Steel, Effluents, Water pollution control, Water pollution, Water pollution treatment, Foreign research, Europe, Chemical

Identifiers: *Finland.

Effluents of forest, chemical, and metal-working industries often contain colloidal particles difficult or impossible to remove by normal treatments. In a 1970 study of cathodic protection of steel against corrosion by pulp mill waste waters, sudden clarification with flock formation was noticed in dark waste waters containing much suspended solids. Charge neutralization and stabilization of colloids by the strong electric field was suspected, but the phenomenon was nonreproducible. Studies resumed in 1974 at the Metallurgy Department of Helsinki's Technological University indicated that the electric field along could not stabilize the col-loids, but that conditions suitable for neutralizing the colloids could be achieved by simultaneous anodic dissolution of Al or Fe flock. (Brown-IPC) W75-11348

POSSIBILITIES OF REUTILIZATION OF KAOLIN FROM BIOLOGICAL WASTE WATER SLUDGES (MOEGLICHKEITEN DER WIEDERVERWERTUNG VON KAOLIN AUS BIOLOGISCHEN ABWASSERCHLAEMMEN), Papierfabrik Biberist (Switzerland).

J. C. Ulrich. Das Papier, Vol 29, No 6, p 245-247, June, 1975. I fig, English summary.

Descriptors: *Sludge treatment, *Incineration, *Industrial wastes, Wastes, Sludge disposal, Abra-sion, Pulp and paper industry, Water pollution sources, Sludge, Clays, *Waste treatment, sources, Sludge, Clar Recycling, *Water reuse.

Identifiers: *Kaolin, Chemical recovery, Papier-fabrik Biberist(Switerzerland), Switzerland, Mul-

The reuse of kaolin from biological waste water sludges could be of interest in the case of sludge burning. Because the biological sludge of Papier-fabrik Biberist (Switzerland) contains 60-70% kaolin, the possibilities of kaolin recovery are being investigated. During incineration, the coversion of kaolin into mullite must be prevented, because mullite has an abrasive effect. This fact is decisive for the choice of a suitable incinerator. Investigations are in full progress; final results are not yet available. (Speckhard-IPC) W75-11349

5E. Ultimate Disposal Of Wastes

ILLINOIS LANDFILL LAW MAY EFFECT NEARBY STATES.

For primary bibliographic entry see Field 5B. W75-11011

SOME OBSERVATIONS ON BEHAVIOR OF THE TREATED SEWAGE DISPOSED IN THE

Nihon Univ., Tokyo (Japan). Dept. of Fisheries. For primary bibliographic entry see Field 5B. W75-11020

PROCESS FOR TREATING SEWAGE SLUDGE, American Cyanamid Co., Stamford, Conn. (assignee)

For primary bibliographic entry see Field 5D. W75-11064

MOBILE UNIT FOR TREATING LIQUID

Chemfix, Inc., Pittsburgh, Pa. (assignee)
For primary bibliographic entry see Field 5D. W75-11073

PROBLEMS OF LIQUID WASTE DISPOSAL,

New South Wales Univ., Kensington (Australia). Dept. of Civil Engineering.

For primary bibliographic entry see Field 5G. W75-11112

THE USE OF SOIL AS A PURIFYING SYSTEM (L'UTILISATION DU SOL COMME SYSTEME EPURATEUR),

Institut National de la Recherche Agronomique, Dijon (France). Laboratoire de Microbiologie des

For primary bibliographic entry see Field 5D. W75-11126

DESIGN CONSIDERATIONS--WATER AND EF-FLUENT DISPOSAL,

For primary bibliographic entry see Field 5D. W75-11128

DESIGN OF THE OPTIMAL OUTFALL SYSTEM FOR A STREAM RECEIVING THERMAL AND ORGANIC WASTE DISCHARGES,

Design and Optimization. For primary bibliographic entry see Field 5B. W75-11137 Kansas State Univ., Manhattan. Inst. for Systems

BARK AS TRICKLING-FILTER DEWATERING MEDIUM FOR PULP AND PAPER MILL

SLUDGE, Georgia Inst. of Tech., Atlanta. Dept. of Chemical Engineering.

For primary bibliographic entry see Field 5D. W75-11241

SOLID WASTES, ANIMAL REFUSE, AND ORGANIC RESIDUES DISPOSAL, AND THE QUALITY OF GROUND WATER,

Tuskegee Inst., Ala. School of Applied Sciences. For primary bibliographic entry see Field 5B. W75-11244

er

n-d.

POSSIBILITIES OF REUTILIZATION OF KAOLIN FROM BIOLOGICAL WASTE WATER WIEDERVERWERTUNG VON KAOLIN AUS BIOLOGISCHEN ABWASSERCHLAEMMEN), Papierfabrik Biberist (Switzerland). For primary bibliographic entry see Field 5D. W75-11349

5F. Water Treatment and **Quality Alteration**

THE RESPONSIBILITY OF U.S. WATER SUP-

Senate, Washington, D.C. For primary bibliographic entry see Field 5G.

ORGANIC COLOR IN GROUNDWATER OF MISSISSIPPI.

Mississippi State Univ., Mississippi State. Dept. of Civil Engineering.
M. T. Bond, and J. E. Bowie.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 507, \$4.25 in paper copy, \$2.25 in microfiche. Mississip-pi Water Resources Research Institute, Mississippi State, Completion Report, July 1975. 56 p, 12 fig, 4 tab, 16 ref, 7 append. OWRT A-084-MISS(1).

Descriptors: *Color, Water quality, Groundwater, Water supply, *Mississippi, Water wells, Polyelectrolytes, Waste treatment, *Water treatment, Hydrogen ion concentration. Identifiers: Organic color.

The objectives were to identify the substances in groundwater that produce organic color and to evaluate techniques to remove the color from water supplies. Eight wells having very little or no iron content were selected as sampling sites for preliminary characterization studies. Organic colors ranged from 15 units to 140 units. All samples had a pH between 8.3 and 8.7. An analysis of the color material in the water strongly indicated that it was a tannin and lignin like substance. A near linear correlation exists between tannin and lignin concentrations and color units in water. Organic color could be removed from groundwaters most effectively by adjusting the pH downward and adding alum and a polyelectrolyte at a proper dosage. Alum requirements were 60-70 mg/l for all waters at a pH of approximately 6. The polyelectrolyte requirements varied with the intensity of color. Activated carbon is not an effective method to remove organic color greater than 40, and possibly much lower, from groundwater. It may be effective to remove residual color after chemical physical treatment. W75-10907

DISINFECTING WASTEWATER CHLORINATION/DECHLORINATION PART 1, For primary bibliographic entry see Field 5D. W75-10963

DISINFECTING WASTEWATER WITH CHLORINATION/DECHLORINATION PART 2. For primary bibliographic entry see Field 5D. W75-10964

LIQUID CO2 PROTECTS OUR WATER'S QUALITY, Kansas City Water Dept., Mo.

D. R. Boyd.

The American City, Vol 90, No 1, p 57-58, March, 1975, 2 fig.

Descriptors: *Water quality, *Carbon dioxide, *Water purification, Costs, Lime, Flow rates, *Carbon dioxide, *Water treatment, Missouri, Waste water treat-

Identifiers: *Recarbonization, Kansas City(Mo).

The Kansas City, Missouri, Water Department utilizes recarbonization as an essential step in their water purification method. This step is used to neutralize and stablize the water after it has been softened with lime. In the past the Kansas City plant produced their own carbon dioxide with on site generators. They are now using commercial carbon dioxide. The advantages of using liquid carbon dioxide are cost, superior purity and quali-ty of gas, no contamination of the water, shorter filter runs, and prevention of carbon monoxide formation. The Kansas City plant processes an average of 105 mgd with a high of 178 mdg and low of 85 mgd using an average of 339 pounds of carbon dioxide vapor per million gallons of water for recarbonization. The liquid carbon dioxide is stored in 4 fiberglass insulated refrigerated lowpressure tanks with a 24-ton capacity each. In the recarbonization basins the water passes in an undulating motion over and under a series of trans-verse verticle baffles. The excess alkalinity of the water is neutralized to a pH of 9.7 by the carbon dioxide. (Dean-FIRL) W75-10990

WATERBORNE GASTROENTERITIS EPIDEMIC IN PICO RIVERS, CALIFORNIA Los Angeles County Health Services Dept., Calif. Immunization Project.

Immunization Froject. L. E. Mahoney, C. T. H. Friedmann, R. A. Murray, E. L. Schulenburg, and G. A. Heidbreder. American Journal of Public Health, Vol 64, No 10, p 963-968, October 1974. 3 fig, 4 tab, 10 ref.

*Public *Chlorination, *Water supply, Reservoirs, Coliforms, *California, Water treatment, Water pollution effects.

Identifiers: *Sewage poisoning, Fecal coliform, Gastroenteritis, Pico Rivera(Calif).

An outbreak of acute nonspecific gastroenteritis occurred between July 29 and August 7, 1971 when about 11,000 residents of Pico Rivera, California, became ill. Symptoms included diarrhea, stomach cramps, nausea, vomiting, fever, and menatochezia. These symptoms are compatible with the syndrome of sewage poisoning. Sanitary and epidemiology investigations determined that the source of the illnesses was water from a reservoir serving part of the town. Chlorination at the reservoir was interrupted for about a week starting July 29, 1974 due to an unattended chlorinator that was out of chlorine. The area served by the reservoir showed heavy fecal coliform contamination in water samples taken. The contamination was further localized to a portion of the water line. Although the common feeling is that waterborne gastroenteritis outbreaks in the United States are things of the past, current statistics suggest that common source outbreaks of waterborne disease may continue to occur with some frequency. (Orr-W75-11005

INDUCED INFILTRATION SUPPLY SYSTEM

AMONG BIGGEST. Water and Pollution Control, Vol 112, No 9, p 33, 38-39, September 1974. 2 fig.

supply, *Aquiters, *Water Descriptors: *Water suppl *Infiltration, Water resources, *Canada, Water treatment, Facilities, Construction

Identifiers: *Fehlmann collector, *Induced infil-

An induced infiltration supply system including pump house for a water supply system has recently been installed for the City of Prince George, British Columbia. The system cost around \$1.2 million which was a 44% saving over the estimated cost of a river intake and treatment plant. In addition to the capital cost saving, there will be an-nual operating cost savings in the form of chemical treatment, operation and maintenance costs as-sociated with surface water treatment plants. The completed project includes a Fehlmann collector, one of the highest capacity ground water collectors in the world. An investigation was done to

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5F-Water Treatment and Quality Alteration

determine the best method of supplying water which included drilling and logging test wells, constructing temporary pumped wells, and aquifer testing an extensive glacial outwash area along the Nechako River. The Fehlmann collector is guaranteed to produce a minimum of 10 mgd up to a maximum of 15 mgd. The collector consists of a 16 ft inside diameter caisson of reinforced 4000 psi high early strength concrete with 1.5 ft thick walls and a bottom of 6 ft thick reinforced concrete. Other specifications and details of construction and operation are given. (Orr-FIRL) W75-11010

BIOLOGICAL CONTROL: ISOLATION AND BACTERIAL OXIDATION OF THE TASTE-AND-ODOR COMPOUND GEOSMIN.

Detroit Univ., Mich. Dept. of Biology.

L. V. Narayan, and W. J. Nunez. Journal of the American Water Works Associa-tion, Vol 66, No 9, p 532-536, September, 1974. 6 fig, 2 tab, 13 ref.

Descriptors: *Biodegradation, *Odor-producing algae, *Odor, *Bacteria, Taste, Water quality, Biological treatment, *Biocontrol, Microbial degradation, Oxidation, Microorganisms, Isolation, Water supply.

Identifiers: Bacillus sp, *Geosmin, Anabaena cir-

A variety of microorganisms have been cited as the causes of naturally occurring tastes and odors in water supplies. The two most important of these microbial odor causing compounds are mucidione and geosmin. The isolation of geosmin from Anabaena circinalis, determination of the threshold odor level, enrichment culturing of microorganisms, cell cultivation and collection, and oxidative degradation were studied. Geosmin was found to be the primary odor component in Anabaena circinalis. The distillation and extraction of the entire algal culture of Anabaena circinalis, cells and medium, yielded more geosmin than distilling the algal cells along. The geosmin in the medium was probably the result of a release of metabolites during physiological transitions of the algal culture. Manometric oxidation studies were found to be useful for scanning microorganisms as agents for controlling taste and odor compounds in water. Sarcina sp., Micrococcus sp., Mima sp., Escherichia coli, Alcaligenes viscolactis, and Bacillus sp. were all examined in regard to their ability to degrade geosmin. Bacillus sp. appeared to be the best bacterial organisms for biological control of odor causing metabolites. Bacillus cereus strain 10876 has previously been reported as the best strain of bacteria for the degradation of geosmin. However, Bacillus subtilis strains and Bacillus cereus strain ATCC 9139 proved to be as effective as Bacillus cereus strain 10876 in degrading geosmin. (Orr-FIRL) W75-11013

CITY/TOWNSHIP JOINT VENTURE--A NEW WATER PLANT,

East Lansing-Meridian Water and Sewer Authority, East Lansing, Mich. W. K. Kyes.

Water and Sewage Works, Vol 232, No 8, p 88-91, August, 1974. 3 fig.

Descriptors: *Water treatment, *Water supply, *Domestic water, Water softenining, Hardness(Water), Water purification, Water wells, Filters, Treatment facilities, *Michigan. East Lansing(Mich), Meridian Identifiers: Township(Mich).

The East Lansing-Meridian Water and Sewer Authority was formed in 1969 to provide a sufficient quantity of fully treated water to the City of East Lansing and adjoining Meridian Township. A water treatment plant was put in operation in 1973 which provides 15 mgd of water containing 85 mg/liter or less of hardness and no iron. The plant incorporates an in-house lime handling system to transfer the pebble lime from large storage bins to day bins positioned over the lime feeders. Pretreatment is provided in two primary clarifiers and two secondary clarifiers. Mixing, flocculation and sedimentation are performed in one tank. Wood plank deck and laminate wood beams were chosen to cover the pretreatment tanks because of the lower capital cost than that of a concrete roof and the lack of future maintenance requirements. A concrete roof would have cost more and required periodic painting. After pre-treatment, the water is applied to dual media (sand covered by anthracite) gravity sand filters for removal of chemical floc. Lime soda softening of the water results in two waste by-products: the backwash water is stored in an earthen pond and recycled to the inlet of the plant; the line sludge is stored a lagoon system where the solids settle out and the clear supernatant left is collected and pumped back to the plant. The plant functions with semiautomatic controls. Sixteen new wells, more than 9 miles of pipe to transport the water to the plant and 2 miles of distribution mains were developed in conjunction with the water treatment plant. (Orr-FIRL)

HOW SILICA AFFECTS IRON REMOVAL FROM GROUNDWATER, Yule, Jordan and Associates, Camp Hill, Pa. En-

vironmental Engineering Div.

L. R. Robinson, Jr. Water and Sewage Works, Vol 122, No 3, p 74-77, March, 1975, 9 tab, 18 ref.

Descriptors: *Groundwater, *Water treatment, Iron, *Oxidation, *Silica, Hydrogen ion concentration, Alkalinity, Pilot plants, Laboratory tests, Waste water treatment Identifiers: *Iron removal

Interference with iron oxidation and removal is frequently attributed to low pH and low alkalinity concentrations. It has also been indicated that high concentrations of silica can catalyze ferrous iron oxidation and retard hydrolysis of ferric iron and thus hinder sedimentation and filtration. The results of both jar tests and pilot plant studies indicate that silica interference with iron removal is apparently the reaction of silica in alkalinity determinations to indicate sufficiently high bicarbonate alkalinity to insure rapid ferrous iron oxidation. When lime or soda ash were added, satisfactory iron oxidation and removal was achieved. These results confirm the hypothesis that a bicarbonate alkalinity of at least 100 mg/liter as CaCO3 is necessary to obtain immediate oxidation and subsequent removal or iron from groundwater. Tests were performed on several groundwater supplies in East Pakistan where poor iron removal was ob-tained even though alkalinities were found to be in excess of 100 mg/liter. Silica was observed in significant concentration in several of the waters stu-Where treatability was unsatisfactory, the addition of lime or soda ash was successful in causing the oxidation of the iron. The addition of silica in the form of sodium metasilicate had no effect on the treatability of the water. (Orr-FIRL)

PREVENTING BACKFLOW IN PIPING CROSS CONNECTIONS, Watts Regulator Co., Lawrence, Mass

For primary bibliographic entry see Field 5B. W75-11018

CORROSION BY DOMESTIC WATERS.

Illinois State Water Survey, Urbana. T. E. Larson.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 723, \$4.25 in paper copy, \$2.25 in microfiche. Bulletin 59, 1975. 48 p, 32 fig, 2 tab, 38 ref, 3 append. Descriptors: *Corrosion, *Corrosion control, *Domestic water, Pitting(Corrosion), Pumps, Water wells, Materials, Laboratory tests, Water quality, Water chemistry, Metals, Flow rates, Pipes, Distribution systems, *Water treatment, Chemical reactions, Scaling, Dissolved oxygen, Hydrogen ion concentration, Laminar flow bulent flow.

Identifiers: Tuberculation, Cold water, Hot water, Carrying capacity loss, Calcium carbonate satura-

Essential data on corrosion by domestic waters gathered by the Illinois State Water Survey in iso-lated or programmed studies, and from experience at state institutions since 1950, were summarized. Domestic water was defined as any water provided for human consumption and allied uses, in contrast to sea water, brines, or conventional sewage effluents. Corrosion was defined as the destruction of a metal usually by chemical or electrochemical reaction with its environment. A brief review of basic fundamentals of corrosion was presented as background for the summaries of corrosion data. Also included were some of the general and specific recommendations concerning inhibitors and construction materials that were developed through laboratory and field evaluations for use by architects, engineers, and institu-tional maintenance personnel. Research needs were indicated. Appendixes contain: (1) a discussion of corrosion in water wells and pumps; (2) a description of the dynamic nature of distribution systems and the problems that can exist; and (3) documentation of actual changes in water quality resulting from microbiological growths to the point of removal of all oxygen, and then further cha under anaerobic conditions in a 6500-foot isolated water line at the end of the system. (Humphreys-W75-11062

SYSTEM FOR SOFTENING AND DEALKALIZ-ING WATER BY ELECTRODIALYSIS,

Vast (J.) Associates, Inc., New York. (assignee) A. R. Teieda.

U.S. Patent No 3,893,901, 12 p, 8 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 653, July 8, 1975.

Descriptors: *Patents, *Water treatment, *Water quality control, *Water softening, *Alkaline water, *Electrodialysis, Electrodes, Permselective membranes, Anion exchange, Cation exchange, Separation techniques. entifiers: *Dealkalization

The object is to provide an electrodialytic system which by suitable adjustment of the types of exchange material and permselective membranes employed is capable of either softening or dealkalizing water at a low power consumption and high efficiency. For softening, the water is passed through a cation exchange material placed between a pair of cation permselective mem-branes. For dealkalizing, the water is passed through an anion exchange material placed between a pair of anion permselective membranes. The ion exchange permselective membranes of like types having ion exchange material of the same type located between them form a chamber in an electrodialytic cell with electrodes at opposite ends of the cell to which a source of direct current is applied. (Sinha-OEIS) W75-11065

PROCESS FOR RAW WATER CLARIFICA-TION.

Cyanamid Co., Stamford, Conn.

(assignee)
H. P. Panzer, and K. W. Dixon.
U.S. Patent No. 3,894,945, 7 p, 8 ref; Official Gazette of the United States Patent Office, Vol 936, No 3, p 1007, July 15, 1975.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Treatment and Quality Alteration—Group 5F

Descriptors: *Patents, Water quality control, Water pollution control, *Water purification, Suspended solids, Turbidity, Natural streams, Chemical reactions, Water supply, Polymers, Organic compounds, *Water treatment.

Identifiers: *Clarification, *Chemical treatment.

A process is described for clarifying raw water or natural water. The water is treated with an effective amount of a water-dispersible polyquaternary nive amount of a water-dispersible polyquaternary polymer consisting essentially of the reaction product of a lower dialkylamine, a polyfunctional amine, and a difunctional epoxy compound selected from the group consisting of epihalohydrins, diepoxides, precursors of epihalohydrins and diepoxides which under alkaline conditions are readily converted into the corresponding epoxy compounds and mixtures. -OEIS) W75-11072

LOW TEMPERATURE WATER PURIFICATION

SYSTEM,
Pollution Control, Inc., South Barre, Vt. (assignee)

G F Humiston

U.S. Patent No. 3,893,894, 9 p, 2 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 651, July 8, 1975.

Descriptors: *Patents, *Water purification, *Water treatment, *Water quality control, Separation techniques, Centrifugation, Evaporation, Distillation, Temperature, Equipment, Heat

pumps. Identifiers: Vacuum evaporation, Vacuum distillation, Low temperature.

A low temperature purification system is provided which is particularly adapted for use to mechanically purify in a continuous operation solutions containing solids and dissolved substances. The purification system includes a solution supply means, and a centrifugal vacuum evaporator to which the solution to be purified is fed from the solution supply. Drive means are operatively connected to the evaporator for subjecting the solution within the evaporator to centrifugal acceleration thereby causing the solids in the solution to be displaced outwardly of the axis of rotation of the solution and the liquid of the solution is displaced inwardly toward the axis of rotation. Outlet means are embodied in the evaporator for discharging the solids. The liquid as it is being displaced inwardly is simultaneously subjected to vacuum distillation to produce vapor. This vapor in turn is condensed to a substantially pure liquid. A heat pump is provided in the system between the centrifugal vacuum evaporator and the condenser means. The heat pump operates to transfer the heat of conden-sation absorbed by the condenser back to the centrifugal vacuum evaporator to supply heat to the solution in the evaporator to replace the heat loss as the liquid is transformed to vapor. The system includes means for providing heat energy in the solution being introduced to the vacuum evaporator to provide a minimum temperature in the body of the solution within the evaporator and to com-pensate for heat losses within the system. (Sinha-OEIS) W75-11074

TOTAL WASTE RECYCLE SYSTEM FOR WATER PURIFICATION PLANT USING ALUM

WATER PURIFICATION PLANT USING ALUM AS PRIMARY COAGULANT,
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5D. W75-11094

TREATMENT BY OZONE, (IN JAPANESE), For primary bibliographic entry see Field 5D. W75-11107

OPTIMUM VALUES FOR OPERATIONAL VARIABLES IN TURBIDITY REMOVAL, Mosul Univ. (Iraq).

For primary bibliographic entry see Field 5D. W75-11110

WATER TREATMENT FOR PUBLIC SUPPLY, M. A. Hilson.

Chemistry and Industry, Vol 1, p 21-25, January 4, 1975. 1 tab, 2 ref.

Descriptors: *Water treatment, *Potable water, *Water quality control, Water distribu-*Water quality control, Water distribu-tion(Applied), Flocculation, Coagulation, Filtra-tion, Sedimentation.

Various Acts of Parliament have put the burden on the supplier of supplying water that 'is free from visible suspended matter, color, odor and taste, and from all objectionable bacteria indicative of the presence of disease producing organisms and contains no dissolved matter of mineral or organic origin which in quality or quantity would render it dangerous to health, and will not dissolve substances from the distribution system which are in-jurious to health.' Water treatment to obtain such a water falls into 3 stages: bacteriological sterilization; chemical purification to remove objectiona-ble matter; and, quality adjustment to ensure that the water does not pick up any harmful substances during distribution. The processes available to achieve the various stages are presented with emphasis on the processes used by the Fylde Water Board, Great Britain. Chlorine, chlorine dioxide, ozone, or ultraviolet radiation may be used for the sterilization of water. Chemical clarification consists of two stages: flocculation and separation of the solid material formed from the bulk of the water. The first step is achieved by the addition of a controlled dose of a coagulant. The floc formed during coagulation can be made tougher and denser by the addition of polymeric compounds. The removal of the solids from the water can be carried out either in a single stage process by direct filtration or by a two stage process of sedimentation followed by filtration. Water softening can be accomplished by precipitation or by ion exchange. Final quality adjustment is the adjustment of the pH value to a level at which the water will not corrode the pipelines or deposit calcium carbonate in the system. (Orr-W75-11119

CAN A COMPUTER REALLY OPERATE A WATER-FILTRATION PLANT,

Kennedy Engineers, Inc., Tacoma, Wash J. Watkins, Jr. Journal of the American Water Works Associa-

tion, Vol 67, No 7, p 351-352, July 1975.

Descriptors: *Water treatment, *Filtration, *Treatment facilities, *Operations, *Control, *Computers, Water quality, Flow, Measurement, Monitoring, Simulation analysis, Computer programs, Hydraulics, Industries, Mathematical models, Systems analysis, Chemicals, Evaluation.

Identifiers: Process control, Real-time, Prediction,

In view of today's technology, the ability of the computer to independently perform process control functions on a real-time basis in the operation of a filtration plant is evaluated. To control any function, one must predict the response of the function. Given are the specifications for a mathematical system model to predict, monitor, and control the variables of the process. The Santa Clara District's Rinconada treatment plant is util-ized to illustrate a typical filtration plant using a full treatment process (chemicals, coagulation, sedimentation, filtration, and chlorination). In such a plant, control of two processes is necessary: the hydraulic flow of water through the plant and the treatment process itself. The first can be readily calculated and simulated. Two problems, however, make it extremely difficult to develop mathematical control models for the treatment process: (1) water treatment is still partially an art and not completely a science; and (2) There is a lack of good primary instrumentation to measure and control process variables so as to perform control functions on a real-time basis. In conclusion, further development of mathematical equations of the chemical and physical process, process techniques, and equipment and instrumentation are needed before the computer can independently exercise these control functions. Those functions which a computer can perform beneficially in a treatment plant operation, based on Santa Clara experience, are given, and recommendations are made that include enlisting aid of a control systems engineer and selecting an appropriate computer. (Bell-Cornell) W75-11184

AQUATIC PLANT CONTROL USING HERBI-CIDES IN A LARGE POTABLE WATER SUPPLY, Virginia Polytechnic Inst. and State Univ.,

Blacksburg. Dept. of Fisheries and Wildlife Sciences. For primary bibliographic entry see Field 5G. W75-11201

ALGAE IN BALTIMORE'S RESERVOIRS,

Baltimore City Dept. of Public Works, Md. Water Supply Treatment and Pumping Div. For primary bibliographic entry see Field 5C. W75-11221

ELECTROLYTIC CONTROL OF ALGAE, Calcutta Metropolitan Development Authority

(India) S. K. Paul, K. V. Chari, and B. Bhattacharyya. Journal of the American Water Works Association, Vol 67, No 3, p 140-141, 1975. 8 fig, 1 tab.

*Algal control, *Chlorophyta, Descriptors: *Electrolysis, *Water treatment, Electrodes, Settling velocity, Electric currents, Water pollution

Algae in water fed to water treatment plants and recirculated effluent from stabilization ponds can be controlled by electrolytic treatment. Experiments were conducted on cultures of planktonic algae (Chlorophyta). Individual organisms were mounted on microscope slides, the current passed momentarily, and the treated cells examined to determine damage and if they were dead. Stained dead organisms did not plasmolyze. Also algaeladen water was passed through a gap between two steel electrodes to avoid toxic effects of copper ions in solution. Maximum voltage was 200 volts, water temperature 26-42C, and the minimum gap between the electrodes was selected to avoid clogging by filamentous organisms. When treated water samples were exposed to diffuse sunlight, photosynthesis was weak or absent, and the green color bleached slowly. Dead algae settled quickly and regrowth did not occur. The lethal action of the electric current may be the result of electrical stress on the organisms, which depends on the potential difference across the cells, maintained by the voltage gradient between electrodes; and diffusion of cellular anions and cations. Both effects are instantaneous and independent of rate of flow between electrodes and concentration of organisms. Current density and voltage are impor-tant factors. (Buchanan-Davidson--Wisconsin) W75-11228

ALGAE CONTROL IN NORTHWEST RESER-VOIRS.

Seattle Dept. of Water, Wash. For primary bibliographic entry see Field 5G. W75-11231

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

5G. Water Quality Control

THE RESPONSIBILITY OF U.S. WATER SUP-

PLIERS, Senate, Washington, D.C. E. M. Kennedy.

American Water Works Association Journal, Vol 66, No 10, p 559-562, October 1974.

Descriptors: *Water supply development, *Water quality control, *Water quality standards, Water resources development, Political aspects, Social aspects, Social values, Water pollution, Communidevelopment, Governmental interrelations, Legal aspects, Planning, Water reuse, Water demand.

Identifiers: *Water Resources Development Act, *Safe Drinking Water Act.

The problem of providing an adequate supply of water while maintaining and improving the quality of water is discussed. The problem is exacerbated by the increasing demand for water and the public's conception of water as a free and inexhaustible resource. The rising level of pollution in water and the growth of population and industry add new threats to the quality of clean drinking water. The key to the solution is a national water policy implemented under the auspices of federal, state and local governments. The solution will have to be multifold and should include a national commitment to assure an adequate supply of water as is in the Water Resources Development Act. A commitment to end massive pollution and a com-mitment to support a national policy of conservation are recommended also. (Altuve-Florida) W75-10856

FACING THE REAL COST OF CLEAN WATER, Environmental Protection Agency, Washington, D.C

R. E. Train.

American Water Works Association Journal, Vol 66, No 10, p 562-565, October 1974.

Descriptors: *Legislation, *Water costs, *Legal aspects, *Potable water, Water quality, Public health, Water purification, Cost sharing, Governmental interrelations, Federal government, Chlorine, Water quality standards, Water policy, Water treatment, Government finance, Grants, Government supports, Water values, Research and development.

Identifiers: *Safe Drinking Water Act, Public notification, Legislative history

The need for federal standards is emphasized. since many of the water systems in this country do not adequately protect their patrons. This is particularly true of the smaller systems which all have difficulties in meeting water standards. Although there is no drinking water crisis today, there are symptoms of neglect. The passage of the Safe Drinking Water Bill would reduce this neglect because it would require the establishment of national drinking water standards or regulations and would provide federal financial support for the program. The Act is correct in allowing for primarily local or state enforcement and for federal enforcement only if the local government fails to do so. The portion of the Act which calls for public notification concerning environmental matters is significant because a well-informed public is necessary for the maintenance and improvement of quality water systems. (Altuve-Florida) W75-10857

THE IMPACT OF THE SAFE DRINKING WATER ACT ON UTILITIES.

Boston Metropolitan District Committee, Mass.

J. W. Sears. American Water Works Association Journal, Vol 66, No 10, p 573-574, October 1974.

Descriptors: *Utilities, *Water quality control, *Water quality standards, *Potable water, *Environmental sanitation, Cost-benefit analysis, Consitiutional law, Administration, Penal-ties(Legal), Legal aspects, Administrative decisions, Discount rates, Pricing, Water rates, Value, Federal government. Identifiers: *Safe Drinking Water Act, Liabili-

ty(Legal aspects).

The Safe Drinking Water Act is a progressive and reasonable piece of social legislation but there are several potentially troublesome aspects of the act. These include the potential cost for compliance, especially the cost to small systems. The application provisions fail to adequately define what systems are controlled by the act and as a result many systems may not be affected by the act although they are the types of systems that the statutory draftsmen of the act probably envisioned. The possibility of erroneously imposed criminal and civil penalties on administrators who are actually not in a position of control is discussed. Water supply administrators should attempt to create a constituency of citizens who understand and follow their efforts. Pricing rates should be reevaluated and nationwide quantity discounts should be eliminated. (Altuve-Florida) W75-10859

MAN'S INFLUENCE ON THE HYDROLOGI-CAL CYCLE: A DRAFT REPORT OF THE UNESCO/FAO WORKING GROUP ON THE IN-TERNATIONAL HYDROLOGICAL DECADE. Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Develop-

For primary bibliographic entry see Field 2A. W75-10863

AN ANALYSIS OF THE MOTOR-ROW CON-VERSION ISSUE OF COLORADO RIVER FLOAT TRIPS,

Arizona Univ., Tucson. Dept. of Watershed Management.

For primary bibliographic entry see Field 6B. W75-10867

OCCURRENCE OF 2, 4, 5-T AND PICLORAM IN SURFACE RUNOFF WATER IN THE BLACKLANDS OF TEXAS,

Agricultural Research Service, College Station, Tex.

For primary bibliographic entry see Field 5B.

CONCURRENT NITRIFICATION-DENITRIFI-CATION AT THE SEDIMENT-WATER INTER-FACE AS A MECHANISM FOR NITROGEN LOSSES FROM LAKES,

Wisconsin Univ., Madison. Dept. of Soil Science. For primary bibliographic entry see Field 5C.

INFORMATION AS A REGULATORY TOOL IN WATER QUALITY CONTROL, Wisconsin Univ., Madison. Land Tenure Center;

and Wisconsin Univ., Madison. Dept. of Agricultural Journalism.

H. H. Felstehausen.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-244 502, \$3.75 in paper copy, \$2.25 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report WIS-WRC 75-06, June 1975. 29 p, 4 fig, 16 ref. OWRT A-055-WIS(1). 14-31-0001-4050.

Descriptors: *Information exchange, *Water law, *Statutes, *Legislation, Legal aspects, *Water permits, Data processing, Documentation, *Wisconsin, Water quality control, Water quality standards, *Federal Water Pollution Control Act. The Federal Water Pollution Control Amendments of 1972 (Public Law 92-500) were analyzed to test the assumption that a resource well described and well monitored will be well managed. A model was designed of resource legislation which focused attention on: (1) who is being addressed by the law, (2) what actions are to be taken under the law, and (3) what are the defined relationships between actors and objects of action. A content analysis was performed on the 80 sections of the law. In addition, the Wisconsin Pollutant Discharge Permit System was examined. The 1972 Water Pollution Control Act was found primarily to establish an information, monitoring and standards program creating a large data system about water resources and water quality. Of the 80 sections in the law, 75 of them pertained primarily to how the law is to be administered, enforced and reported, not how the water is to be used. This analysis was performed in the context of previous criticism that the regulatory/enforcement procedure will not solve water pollution problems. The study found that an elaborate information system is resulting from the regulatory/enforcement model, but based on the criticism of the model, the vast information system is not to be expected to significantly affect effluent discharges. Several changes are suggested which emphasize technical assistance to the users and information feedback to the pollution dischargers as ways to improve and modify the legislation. W75-10903

WATER POLLUTION PROBLEMS IN SALISBU-RY, RHODESIA: PRESENT AND FUTURE, C. G. Wells.

Water Pollution Control, Vol 74, No 2, p 120-123, 1975. 1 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Water pollution control, Sewerage, Biological treatment, Land management, Irriga-Water supply, Rivers, Lakes, Treatment facilities, Africa

Identifiers: *Rhodesia, Chemical treatment, Land application.

Overall water pollution problems in Salisbury, Rhodesia, are presented, as well as proposals for the future. Between 1950 and 1973, there has been a large increase in population, water consumption, and sewage flow, which has strained both financial and natural resources. The region is on a watershed within the catchment area of its water supply, consisting of the Hunyani River and three tributaries and Lake McIlwaine. It was determined that treated sewage effluents are the major cause of pollution. The regional Council decided that the municipality should be responsible for collection, treatment, and disposal of all Salisbury area sewage; treatment will be concentrated at four works with the largest gravity drainage, close to agricultural land; outfall sewers will be constructed draining to the new treatment facilities; schemes for irrigation of land with sewage ef-fluents will be developed; and continued hydrobiological research will be conducted, as well as studies on chemical treatment of sewage. A combination of biological and chemical treatment and irrigation were formulated such that: during the dry season, all flow will be treated biologically, with effluent being applied to land; and, during the wet season, flow will be treated biologically up to the amount to be irrigated or stored, with excess flows to be treated chemically as raw sewage, with treated effluents being discharged to the river.
(Prague-FIRL) W75-10983

WATER CONSERVATION IN SWEDEN: III. CURRENT TRENDS,

Ministry of Agriculture, Stockholm (Sweden).

S. Lundkvist. Journal Water Pollution Control Federation, Vol 47, No 4, p 673-674, April, 1975.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

Descriptors: *Waste water treatment, *Waste disposal, *Water quality, *Oil pollution, *Water conservation, Governments, *Permits, Water pollution control, Potable water, Aquatic life, Oil spills, Lakes, Municipal water, Industrial wastes. Identifiers: *Sweden.

The Swedish government passed the Environmental Protection Act in 1969, requiring that dischargers of municipal waste water as well as industrial effluents have a permit. Government subsidies of waste water treatment plants seven years ago have led to large-scale construction and increased efficiency. The problems of water management are improving water conditions, stopping further pollution, and repairing present damages. Because 80 percent of Swedish Water consumption is industrial, between 1970 and 1974, 275 million dollars were invested in industrial pollution control, 102.5 million of this as government subsidies. A dramatic decrease in pollution discharge has resulted; for example, BOD has decreased by 520 tons per day. Use of DDT and PCB has also been regulated and curtailed. Oil pollution has been a major water conservation problem. The Swedish Coast Guard, which registers about 250 oil spills per year, has increased its harbor facilities for handling oily wastes and has developed special vessels and depots to deal with the problem. Mercury discharges, which had made fish unfit for human consumption, have been reduced since 1967 from 30 to 40 tons per year to present levels of 800 kg per year. Other marine research has been conducted on water exchange and material balance on lakes, rivers, and groundwater. Lake restoration methods in several areas have used mechanical removal of vegetation and sediments, chemical treatment with flocculants to reduce organic matter and nutrients, oxygenation of bottom waters, and biological methods. Continued environmental protection of Sweden's coastal waters is being provided by agreements with neighboring countries, on its western coastlines and on the Baltic. (Prague-FIRL) W75-10987

HIERARCHIAL HIERARCHIAL MODEL SUPPLY-SYSTEM CONTROL, FOR WATER-

Cambridge Univ. (England). Dept. of Engineering. For primary bibliographic entry see Field 4A. W75-10996

ROLE AND RESPONSIBILITIES OF THE EN-VIRONMENTAL PROTECTION SERVICE (CANADA),

Environmental Protection Service. Ottawa (Ontario). For primary bibliographic entry see Field 6G. W75-11000

OIL SPILL TECHNOLOGY, Environmental Protection Service, Ottawa (Ontario). Environmental Emergency Branch. S. L. Ross.

In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, Vancouver, British Columbia, p 125-141. 5 fig, 2 tab.

Descriptors: *Water pollution control, *Oil spills, Environmental control, Environmental engineering, Disasters, Oil pollution, Oil wastes, Technolo-

The Environmental Emergency Branch of Environment Canada was formed to cope with en-vironmental emergencies. To deal effectively with environmental emergencies, the following must be considered: analysis of the threat; preparedness; and, evaluation of the risk. The state of preparedness is dependent on: the contingency plan which assigns the responsibilities and personnel necessary to reduce the damages due to an emergency; the training of the personnel; and, the availability of proper equipment, techniques and materials. Most of the materials, techniques and equipment currently used are unsatisfactory in terms of their application, labor requirements, sophistication, and/or effectiveness. Research and development requirements in the following areas are representative of the lack of scientific knowledge: diking of storage facilities; detection of spills; containment of spills; recovery of oil and other hazardous materials; and, cleaning and restoration of beaches contaminated with oil. The examples given deal with oil spills but are applicable for other types of environmentally hazardous materials. Guidelines are given for assessing every project for the evaluation and development of new technology. (Orr-FIRL) W75-11001

WATER RESOURCES,

British Columbia Water Resources Service, Vancouver

In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, Vancouver, British Columbia, p

Descriptors: *Planning, *Administration, *Water pollution control, Waste water treatment, Legisla-tion, Water resources, *Canada. Identifiers: *British Columbia.

The functions and responsibilities of the British Columbia Water Resources Service include water licensing, water investigations (engineering and planning), pollution control, and environmental matters. The pollution control and environmental activities of the Water Resources Service are discussed. A series of public inquiries into each of the major categories of waste discharge in B. C. were held beginning in 1970. Three levels of objectives have been established for most classes of discharge. These objectives will be upgraded or amended to incorporate and reflect changes in technology, economic conditions, and public at-titudes. B. C. has developed a discharge permit system. The last five years have seen a good inventory of discharges compiled, objectives set for most types of discharges, and identification of environmental, technical, and administrative problems. A need exists for flexibility in planningregional, site, resource development, and waste management planning. The structure within the Water Resources Service is being integrated and decentralized. Investigations are being performed to increase the department's expertise in environmental sciences. Waste treatment plant operator training programs are being initiated. (Orr-FIRL) W75-11003

MILESTONE WATER LEGISLATION ACCOM-PANIED BY MILLSTONE OF BUREAUCRATIC RED TAPE.

Hampton Roads Sanitary District, Norfolk, Va. W. A. Cox. Professional Engineer, Vol 44, No 10, p 21-23, October 1974.

Descriptors: *Water quality, Planning, *Legislation, *Federal jurisdiction, Effluents, Water pollution control, Treatment facilities, Regulations, Waste water treatment, Participating funds, Costs.

Identifiers: *Public law 92-500.

Since the passing of Public Law 92-500, water quality planning has been improved. However, the processes and steps required to activate a new major waste treatment facility are time-consuming and costly. Uniform effluent limitations to meet 1977 and 1983 treatment method deadlines impose a great deal of pressure on municipalities, especially on their consulting engineers. Applications for funding are processed slowly at the Federal level; Congress has also impounded many of the existing funds. It was recommended that modifica-tions be made either in the law or in the implementation of regulations to ease some of the burden. These include: modification of the time frame constraints; release of impounded funds to stimulate new jobs and manufacturing; reduction of the Federal percentage of participation in funding water pollution control projects; streamlining of the fund distribution process; and, the reinstatement of provisions for reimbursement to much projects in the provisions for provisions for the provisions f nicipalities. In addition, it was suggested that more responsibility be delegated to the states, that fund allocation to the states be resumed on a population basis, and that the requirements for user charges be amended to allow localities and regional agencies to employ the types of financial procedures used under state laws and municipal ordinances. Finally, one should establish a continuing review of required treatment standards so that they remain flexible to consider demands of the nation's critical energy supply, operating and capital costs, and effects of treatment on receiving waters. (Prague-FIRL) W75-11007

COST EVALUATION OF WATERCOURSE MANAGEMENT IN ESSEX,

Cambridge Univ. (England). Dept. of Applied Biology

M. P. Brooker, and J. H. Baird. Surveyor Public Authority Technology, No. 4288, p 34-37, August 16, 1974. 2 fig, 2 tab, 2 ref.

*Watercourses(Legal Descriptors: aspects). *Drainage systems, *Herbicides, Environmental effects, *Costs, Odor, Taste, Potable water, Water supply, Public health, Agriculture, Chem effects.

In England Wales about 3 million acres of agricultural land are entirely dependent on drainage systems of dykes and larger channels and an additional 2 million acres on wet ditches. The maintenance of good drainage by keeping the water-courses free of vegetation is of national importance. In the past, clearing of the channels has been by 'brushing' or cutting and subsequently removing vegetation from the channel by hand. However, chemical control such as the use of herbicides is becoming a more desired solution to this problem. Detailed records have been kept which allow a direct comparison of the unit costs of chemical applications and conventional hand clearance; the unit cost per annum of herbicide treatment is about 50-75% of the conventional hand clearance, raking and disposal. Other factors than cost are involved in the choice of whether to use chemical control. The most important are the implications of using water containing herbicides for potable and agricultural purposes and the ecological effects of their use. The dosages used in chemical control are unlikely to produce acute toxic effects in man or livestock. One problem intoxic effects in man or uvestock. One problem involved with using herbicide containing water for public water supply is the presence of tastes and odors. If recommendations for use are followed correctly, herbicides such as 2,4-D and dalapon are unlikely to affect crops irrigated with treated drainage water. The ecological effects on birds by destroying their nesting places and the change in the benthic invertebrates which may in turn cause in fish populations and the effects of chronic doses of herbicides on human and farmstock populations must be evaluated before widespread use of chemical control for watercourse management can be instituted. (Orr-FIRL) W75-11008

FRESHWATER ECOSYSTEM RESEARCH IN WATER QUALITY MANAGEMENT, Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.

For primary bibliographic entry see Field 6G. W75-11012

YWA PLAN FOR CLEANER RIVERS, For primary bibliographic entry see Field 5D. W75-11017

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G—Water Quality Control

COST SHARING TO HELP CLEAN OUR WATERWAYS.

Dimensions NBS, Vol 58, No 12, p 267-269,

Descriptors: *Costs, *Federal Water Pollution Control Act, *Economics, *Cost sharing, Waste water treatment, Federal government, Municipal water, Industrial water, Treatment facilities,

Identifiers: National Bureau of Standards, Construction Grant Program

The National Bureau of Standards (NBS) was asked to evaluate the Construction Grant Program by the Environmental Protection Agency, a federal cost-sharing program as defined after the Federal Water Pollution Control Act Amendments of 1972. It was decided by two NBS economists that the cost-sharing is not as efficient or as equitable as it could be. Because the Construction Grant Program provides different levels of Federal funding for different techniques and costs, municipalities may be encouraged to build oversized or inappropriate facilities. The Federal Government sub sidizes 75% of the capital costs and cost of land that is needed for the treatment process but does not cover operation or maintenance. Any technology which requires a large operation and maintenance rather than capital costs expenditure will receive little Federal assistance. Distribution of benefits is discussed. Without effective regional cost-sharing management, it may be difficult to apportion costs appropriately between the regional and the federal sectors. Current user fees imposed on industry, households, and businesses for sewage removal and treatment contribute to inefficiency in the selection of techniques and the size of newly developed facilities. The existing program also results in a larger Federal subsidy to industrialized communities than to residential communities. It was suggested, that with optimal costsharing, municipalities should choose a scale of abatement that is locally and nationally efficient, and then pay a cost share equal to their marginal benefits. (Prague-FIRL) W75-11023

USE OF STEELON-NET VEILS FOR PROTEC-TION OF THE HYDRO-ENGINEERING WORKS AGAINST DREISSENA POLYMORPHIA PALL Wyzsza Szkola Rolnicza, Szczecin (Poland). Dept.

of Hydrozoology. L. Szlauer.

Polskie Archiwum Hydrobiologii, Vol 21, No 3-4, p 391-400, 1974. 1 fig, 3 tab, 7 ref.

Descriptors: *Mussels, *Mollusks, *Design, Construction, Engineering structures, *Nets, Environmental effects, Thermal pollution.

Identifiers: *Steelon-Net veils, Hydro-Engineering installations, *Dreissena polymorpha.

Serviceability of the veils used for safeguarding hydro-engineering installations against Dreissena polymorpha invastion has been studied. Mass settling down of young individuals of this mussel species has been observed on the veil hung in the headrace channel furnishing water to the hydro-engineering installation. The veil of 26 m2/in surface was able to withhold 5 million young mussels. The large-scale of the settling of D. polymorpha on the veil allows for the possibility that a range of veils could protect the hydro-engineering installa-tions effectively against the harmful mussels. W75-11033

PRELIMINARY INVESTIGATIONS COPPER CYCLING IN INDIAN LAKE, MAS SACHUSETTS: A LAKE TREATED ANNUALLY WITH COPPER SULFATE,

Massachusetts Univ., Amherst. Water Resources For primary bibliographic entry see Field 5B. W75-11039

LEGAL AND INSTITUTIONAL PROBLEMS IN THE MANAGEMENT OF SALINITY

Washington Univ., Seattle, School of Law. R. W. Johnson.

Available from the National Technical Informa tion Service, Springfield, Va 22161 as PB-244 730, \$3.75 in paper copy, \$2.25 in microfiche. Completion Report, June 20, 1975. 35 p. OWRT A-076-

Descriptors: *Colorado River basin, Legal aspects, *Institutional constraints, Salinity, Irrigation, Coordination, Management, Water law, Water rights, *Optimum development plans, Federal-State water rights conflicts. Identifiers: *Salinity control.

This study examines the Colorado River basin salinity management program. The optimal solution will generally be found by considering the problem on a basinwide basis. In most cases the optimal solution is one that would result in the least total cost per unit for the largest salinity reduction. This optimal solution requires extensive voluntary cooperation among all water users; it has proven quite effective in the Colorado River basin. The recommendations for a comprehensive basinwide or regional management entity to plan and implement a salinity control program for the Colorado Basin have, to date, produced a voluntary, cooperative interstate discussion group, the 'Colorado River Basin Salinity Control Forum.' To date all irrigation efficiency and water use management programs have been voluntary and are based on education and persuation rather than on legal regulation. Most water managers and other experts in the Colorado Basin believe the voluntary program will, in the long run, be more W75-11047

PROCESS STUDIES AND MODELING OF SELF-CLEANING CAPACITY OF MOUNTAIN CREEKS FOR RECREATION PLANNING AND MANAGEMENT, Utah State Univ., Logan. Dept. of Civil and En-

vironmental Engineering.
For primary bibliographic entry see Field 5B.

CORROSION BY DOMESTIC WATERS, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 5F. W75-11062

SEPARATOR WITH COALESCING OIL. MEDIA,

Amoco Production Co., Tulsa, Okla. (assignee) L. W. Jones

U.S. Patent No. 3,893,925, 4 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 936, No 2, p 660-661, July 8, 1975.

Descriptors: *Patents, *Water pollution treatment, *Water quality control, *Separation techniques, *Oil pollution, Oily water, Sulfur, Coalescence, Pollution abatement, Oil wastes.

A system is described for removing dispersed oil from water by contacting the oily water with sulfur to cause the oil to coalesce or agglomerate. A bed of granular sulfur is provided in a vertical tank through which oily water flows downward. An inverted cone shaped member supports the sulfur. This cone shaped member is perforated to permit the passage of fluid but is also provided with protected channels extending from the base of the cone to an oil gathering chamber at its apex. Oil free water is drawn off at the bottom of the vessel The oil accumulates in the protected channels and being lighter than water rises to the peak or apex of the cone and is drawn off. The water be heavier than the oil has no tendency to rise but falls downwardly to the bottom of the vessel where it is removed. Both coalescence of the oil droplets and separation of the oil from the water is thus accomplished in a single vessel. (Sinha-OEIS)

COMPARISON OF UREDO EICHHORNIAE, THE WATERHYACINTH RUST, AND URO-MYCES PONTEDERIAE, Florida Univ., Gainesville. Dept. of Plant Patholo-

Mycologia, Vol 67, No 3, p 653-657, May-June 1975 9 fig. 1 tab, 8 ref. OWRT A-027-FLA(6), 14-

Descriptors: *Plant pathology, Aquatic plants, *Aquatic weed control, *Biocontrol, *Florida, *Water hyacinth, *Rusts, *Plant diseases, Water pollution control. Identifiers: Uredo eichorniae, Uromyces pon-

tederiae, Pickerelweed rust.

The waterhyacinth, Eichhornia crassipes (Mart.) Solms (Pontederiaceae), is a troublesome aquatic weed in the tropics and subtropics. In Florida, Several control methods have been tried against it including control with plant pathogens. Among potentially useful pathogens is Uredo eichhorniae Fragoso and Ciferri which may be specific to waterhyacinth. This rust has not been recorded since its original description in 1927, but as a result of surveys in the past 4 yr it was found in the Entre Rios province of Argentina. There have been doubts concerning the propriety of the generic name of this rust. The similarity of Uredo eighhorniae to Uromyces pontederiae Gerard on the re-lated genus Pontederia (pickerelweed) has been suggested. Uromyces pontederiae has been reed from Urguay in its uredial stage Eichhornia azurea (Swarts) Kunth, the anchoring waterhyacinth. It is uncertain if teliospores are produced on this plant. In surveys in Argentina, the Dominican Republic, Puerto Rico, Uruguay, and Venezuela, no rust was seen on E. azurea. The occurrence of Uredo eichhorniae on E. crassipes in Argentina is reconfirmed, and it is compared with Uromyces pontederiae from localities in Argentina, Uruguay and Florida. The pickerelweed rust was collected from Pontederia cordata L. and P. lanceolata Nutt. Some consider the two as ecotypes of P. cordata. (Morgan-Florida) W75-11092

GUIDELINES FOR REVEGETATION AND STA-BILIZATION OF SURFACE MINED AREAS IN THE WESTERN STATES.

Colorado State Univ., Fort Collins. Dept. of Range Science. For primary bibliographic entry see Field 4D. W75-11100

A MATHEMATICAL MODEL FOR OPTIMAL WASTE LOAD ALLOCATIONS,

oma Univ., Norman. M. S. Masgati.

Available from University Microfilms, Inc., Ann Arbor Mich, 48106. Order No 74-11,251. PhD Thesis, 1974, 189 p.

Descriptors: *Water quality, *Water pollution control, *Mathematical models, River basin development, Streams, Waste water treatment, Planning, Administration, Regional *Comprehensive planning, Model analysis, studies,

Oklahoma. Identifiers: *Waste load allocations, *Verdigris River basin(Okla).

The first and most important step in regional water quality management is river basin planning. One of the most effective methods of water pollution con-trol is treatment of wastes before discharge. Although planners have other alternatives, this method is easily implemented and convenient to administer. In order to maintain a required level of quality in stream waters, waste load allocations

are made to individual waste dischargers on the basis of the assimilative capacities of the streams in the river basin. Stream waters have been analyzed in the past by large complex simulation models requiring a large amount of input data.
What planners need is a model that is regional in nature, can work with inadequate data, and requires a minimum of man and computer time. Such a model has been developed and is used to analyze the quality of stream water in the Ver-digris River basin. A linear programming model has been developed to make the optimal waste load allocation, thereby minimizing the total cost of waste treatment to a region. (Dean-FIRL)

PROBLEMS OF LIQUID WASTE DISPOSAL, New South Wales Univ., Kensington (Australia). Dept. of Civil Engineering.

W. Gould. The Institution of Engineers, Australia, Civil Engineering Transactions, Vol CE16, No. 1, p 71-74, 1974. 10 ref.

Descriptors: *Liquid wastes, *Water quality control, *Australia, Effluents, Water pollution control, Biochemical oxygen demand, Turbidity, Eutrophication, Fishkill, Toxicity, Reviews.

A review and discussion of the current problems in liquid waste pollution are given. An increasing need is noted in Australia for controlling effluent discharges, due to industrial expansion as well as growth and density of human populations. The types of pollution described include: oxygen con-suming capacity or BOD, which results in fish kills by suffocation; suspended solids, which produce turbidity and reduce penetration of light; pathogenic organisms from enteric human wastes which may spread infections; nutrients which cause eutrophication and upset the ecological balance in waters; toxic materials, especially metals; irritants such as detergents, which are harmful or fatal to fish; dissolved salts, from water used for domestic purposes or irrigation; and car-cinogens, mutagens, and teratogens, which may have long term effects. In addition, the aesthetic value of a stream may be destroyed by foam or grease, and discoloration from dyes or floating rubber can lead to undesired odors and tastes. Ef fluent discharges from both domestic sewage and various industrial wastes are discussed. Solutions to the various problems of liquid wastes in Australia may be found in engineering ability to apply technology to these environmental problems, in political concern and public pressure, and in availability of funds for pollution control facilities. (Prague-FIRL) W75-11112

DRUG RESISTANT COLIFORMS CALL FOR RE-EVALUATION OF WATER QUALITY STANDARDS

National Inst. for Water Research, Pretoria (South

For primary bibliographic entry see Field 5B. W75-11130

A NEW LOOK AT POLLUTION PREVENTION ON LOWLAND RIVERS, Thames Water Authority, London (England).

H. Fish

Water, No 3, p 2-4, April, 1975.

Descriptors: *Water quality control, *Pollution abatement, *Water supply development, Administration, Chemicals, Water pollution sources, Pesticides, Organic wastes.

It has been shown in recent years that current pol-lution control practices will not be adequate for the future protection of public supplies drawn from lowland rivers. This reason has prompted the Thames Water Authority to institute a program for the assessment and control of the extent and nature of continuous contamination of lowland water sources with persistent chemicals. Some of the considerations which have led to this conclusion and new approach include: a recent 3 year dry period which resulted in very high increases in the concentration of residual pollutants, especially nitrates, in river water; the discovery of benthal biomethylation of mercury and bioconcentration and biotranslocation of chemical residues; and, the finding of the transfer of minute herbicide residues from rivers into public water supplies. Basically, the new pollution control approach would put the current system into new overall arrangements to determine, in detail and with all possible accuracy, what chemical contaminants are, or may be, passed into lowland water supply rivers, whether these are likely to present any health hazard in public supplies abstracted from the rivers, and to seek removal or reduction to acceptable levels of all contaminants which are, or are likely to be, dangerous. The new approach can be described as 'catchment quality control'. (Orr-FIRL) W75-11132

HYDROLOGIC INVESTIGATION AND DESIGN STORMWATER DRAINAGE URBAN SYSTEMS.

Snowy Mountains Engineering Corp., Canberra (Australia). For primary bibliographic entry see Field 4A. W75-11141

CONDENSATION IN JETS, INDUSTRIAL PLUMES AND COOLING TOWER PLUMES, Waterloo Univ. (Ontario). Dept. of Mechanical For primary bibliographic entry see Field 2B. W75-11166

TREATMENT PLANT MONITORING PROGRAMS: A PRELIMINARY ANALYSIS, Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering. For primary bibliographic entry see Field 5D.

LOUISIANA ENVIRONMENTAL. MANAGEMENT SYSTEM AND ITS UTILITY IN WATER RESOURCE PLANNING,

Louisiana State Univ., Baton Rouge. Div. of En-

gineering Research. C. A. Whitehurst, E. J. Dantin, and D. Harang. Water Resources Bulletin, Vol 11, No 4, p 734-750, August 1975. 9 fig, 3 tab, 3 ref.

Descriptors: *Water resources development, *Water management(Applied), *Alternative *Water management(Applied), *Alternative planning, *Multiple-purpose projects, *Decision making, *Data processing, Information retrieval, Computers, Simulation analysis, Assessment, Regional analysis, Mathematical models, Systems analysis, Natural resources, Environment, Ecology, Water quality, *Louisiana, Environmental effects, Water pollution control.

Identifiers: Central processing units, Input-output

matrices, Environmental impact.

Louisiana Environmental Management System (LEMS) is a data processing program developed to aid the Louisiana Joint Legislative Committee on Environmental Quality in decisions leading to resources legislation. Serving as a central data collection and retrieval point for various agencies, the LEMS will maintain assembled information on the location of monitoring stations and coordinate the files of user agencies with data on: land use, air and water quality; meteorological, climatological, and hydrological phenomena; vegetation; fish and wildlife conservation; population; and economics. This data is geographically stored in relation to the state plane coordinate system. For decision making, all pertinent hydrologic, topographic, engineering, cadastral, and other information from separate sources can be automatically mapped as a combined overlay to one of three chosen scales. Land-use patterns are the input data for interative analyses of present conditions and simulated future human activities for assessing the environmental impact of proposed multiple-purpose water resource developments. The assessment methodology requires two complementary functions. The first, general data assessment, determines pertinent data and their parameters, programs the data as input-output matrices, and uses the matrices with algorithms to analyze conditions at a particular site. The second, simulation modeling, provides real and predicted data to assess specific problem areas; hydrodynamic and diffusion simulation programs are included. To demonstrate LEMS, an environmental assessment study in the Tenasas River basin (Louisiana) is considered in terms of its multiple-purpose features. Finally, objectives of the Lower Mississippi River Basin Water Quality Management Plan are considered. (Bell-Cornell) W75-11177

STRATEGIC APPROACH TO ESTUARINE EN-VIRONMENTAL MANAGEMENT, Oregon State Univ., Corvallis. Dept. of Civil En-

gineering. For primary bibliographic entry see Field 2L. W75-11179

SIMULATION OF WATER QUALITY MANAGEMENT POLICIES, Virginia State Water Control Board, Richmond.

J. W. Hyden, J. A. Chisman, and H. H. Macaulay. Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 101, No Paper No 11524, p 623-641, August 1975. 5 fig. 4 tab, 4 equ. 12 ref.

Descriptors: *Water quality control. *Environmental engineering, Management, Simulation analysis, Standards, Effluents, River basins, Optimization, Water policy, Economic efficiency, Costs, Waste water treatment, Dissolved oxygen, Systems analysis, Mathematical models, Identifiers: *Effluent fees, Feedback, Cost minimization.

A series of water users are located along a river which is the sole source of water intake and the only place in which to discharge wastewater. For a given set of conditions, a management policy such as effluent standard or charge can be set which reflects the basin-wide economic optimum. As these conditions change with time, however, a previously established policy may give rise to a misallocation of allowable waste discharge levels. resulting in a current actual treatment cost greater than that determined to be optimal under the new conditions. Using the prototype computer simulation program written for this study, the actual and optimal solutions are compared. Simulation runs involving three dynamic conditions--user growth, new users, and variable stream-flow--have been made. Misallocations are noted in actual performance relative to optimal solutions. Under an effluent charge policy, resulting treatment cost surpluses and deficits are partially offset by arge deficits and surpluses, respectively. Under a standards policy, there are no charges to offset misallocations. The general simulation program developed for the study has the following capabilities: (1) development of continuous polynomical cost functions based on actual cost data; (2) determination of the optimal solution using the procedure of the Wilde-Beightler algorithm for a nonlinear objective function subject to linear constraints; and (3) comparison of the optimal solution to the actual response, by user acting under a previously established quality management policy.

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

OPERATION CLEAN SWEEP.

Army Engineer District, Jacksonville, Fla. C. F. Zeiger, J. T. McGehee, and J. F. Willis. In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 5-13, August 1974. 11 fig.

Descriptors: *Water hyacinth, *Aquatic weed control, *Herbicides, 2-4-D, Environmental effects, Spraying, *Florida, Costs, Water pollution con trol

Identifiers: St. Johns River(Fla), George(Fla).

An effort was made to catch and spray the water hyacinths in the St. Johns River from Palatka to Jacksonville, Florida in their early growth stage, since they had been damaged by frost, and to bring the number of plants to manageable proportions before the heavy summar growing season. The long range objective was to reduce the water hyacinth problem to a routine maintenance proportion. A residual shoreline fringe had been left in 1971, but during the mild winter of 1972 the plants flourished. Spraying controlled the Lake George area but large free-floating mats had moved downstream, shifting with the wind, blocking navigation, damaging crab traps, endangering piers, and reducing the amount of dissolved oxygen in the water by the heavy concentrations of the floating plants. During the spring of 1973, the control program had reduced the water hyacinth problem to a routine maintenance situation which required only one airboat to cover the area. The intensified control operation required 50 days to spray 3026 acres with 2.4-D amine at an estimated cost of \$37,000 or \$12.23 per acre. Despite the concentrated spraying there was a heavy population of young bass, possibly due to the cool weather and the vegetation. (See also W75-08289) and the vegetation. (See al. (Buchanan-Davidson--Wisconsin) W75-11192

FIELD TESTS OF SLOW-RELEASE HERBI-CIDES.

Army Engineer District, New Orleans, La.

W. E. Thompson. In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 15-20, August 1974. 6 fig.

Descriptors: *Aquatic weed control, *2-4-D, *Herbicides, *Application methods, *Louisiana, Rubber, Floating plants, Water hyacinth, Submerged plants, Rates of application, Water pollution control.

Identifiers: Slow-release formulations, Water milfoil, New Orleans(La).

Slow-release formulations of the butoxyethanol ester of 2,4-dichlorophenoxyacetic acid (2,4-D) dissolved in natural rubber were developed to treat aquatic vegetation only in specific zones, such as at the water surface or rooted plants at or near the mud-line, eliminating the need for total water column treatment and reducing the amount of chemical applied, frequency of application, and total cost. Three tests were made in the New Orleans are also find the state of a public better the state of the ans area. In a field test of a rubber-herbicide combination with a specific gravity greater than one, surface air bubbles prevented the particles from sinking rapidly enough, causing part of the root to be undertreated and the rest overtreated. This herbicide was not very effective against Brazilian elodia, hornwart or fanwart and even an effective herbicide would not have reached toxic concentrations under the test conditions. Rubber-herbicide suspender strips satisfactorily controlled water hyacinths. Plant bending occurred for a longer time than with foliar treatment but the plants were eliminated in about seven months, and the ditch remained clear of hyacinths. Rubber-herbicide sinkers applied to Eurasian water milfoil sank when

broadcast but were light enough to remain on the plant leaves. Discoloration of the plants was observed in two weeks and vegetation was eliminated in four months. (See also W75-08289) (Buchanan-Davidson--Wisconsin) W75-11193

AQUATIC PLANT CONTROL ON LAKE COR-PUS CHRISTI.

Army Engineer District, Galveston, Tex.

C. J. Novosad.

In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 21-

Descriptors: *Aquatic weed control, *Herbicides, *Water hyacinth, Alligator weed, *Texas, Application methods, Rates of application, Spraying, Costs, Floating plants, Operating costs, tenance costs, Annual benefits, Cost-benefit ratio,

Identifiers: *Lake Corpus Christi(Tex), 2-4-D

Since control of water hyacinths in Lake Corpus Christi, Texas was begun in March 1970, about 17,000 acres have been treated. Most spraying operations were from small boats using 2,4-D toxyethanol ester at a rate of 2 to 4 lbs/acre active acid equivalent. Aerial spraying was also used with increased dosages. Some areas could not be reached by boats or aircraft thus it was necessary to spray using long hoses from boats or land-based At the date of the report the lake was essentially free of hyacinth infestations and required only a small amount of maintenance spraying to control seedlings. The estimated total first cost for the plant control and eradication program was \$724,700 with an estimated annual charge of \$24,550 based on 3-1/4% interest rate for amortization and a project life of 100 years. The annual charges totaled \$29,050 which included \$4,500 for operation and maintenance. The annual benefits for eradication of water hyacinth and alligator weed in ten work areas (Nueces, Guadalupe, Sabine, Trinity, Neches, San Jacinto, and Rio Grande River Basins; Cypress Creek Basin; and north and south coastal areas) were estimated at \$194,040. The benefit-cost ratio was 6.7. (See also W75-08289) (Buchanan-Davidson--Wisconsin)

AQUATIC PLANT RESEARCH AND CONTROL IN FLORIDA,

Florida Dept. of Natural Resources, Tallahassee. For primary bibliographic entry see Field 4A. W75-11195

CRITERIA FOR HERRICIDE EVALUATION.

Environmental Protection Agency, Washington, D.C. Office of Pesticide Programs T. D. Burkhalter.

In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 29-31, August 1974.

Descriptors: *Aquatic weed control. Specifications, *Regulation, *Legislation, Standards, Herbicides, Pesticides, Water quality stan-

Identifiers: *Pesticide registration

The Criteria and Evaluation Division of the Pesticide Program of the Environmental Protection Agency is responsible for the development of guidelines for the registration of pesticides. The authority for the regulation of pesticides is found in the Federal Insecticide, Fungicide, and Rodenticide Act, which specifies the administering agency and delegates to that agency the authority to establish regulations to accomplish its provisions. Regulations generally deal with one provision of an Act, presenting policies and procedures necessary to effectively administer that provision. To clarify the requirements of the Act and the penal-ties for not adhering to them, Congress required that guidelines be published, specifying the kinds of information required to support the registration of a pesticide. Guidelines were prepared to interpret the Act, to detail requirements and suggestions, interrelate information, and answer questions. The guidelines include an appendix of conversion tables and required and suggested methods and procedures. Data will be presented in sections indicating various disciplines in three categories: required, suggested, and tentative. To deal with special problems involved with aquatic pesticide use, Budget Issue Papers are prepared to delineate the problems and recognize the needs for acceptable vocabulary, definitions, testing, and evaluation methods. (See also W75-08289) (Buchanan-Davidson--Wisconsin) W75-11196

51

REGISTRATION OF HERRICIDES

AQUATIC USE, Environmental Protection Agency, Washington,

D.C. Office of Pesticide Programs.
R. J. Hummel, and J. C. Cummings.
In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 33-36, August 1974.

Descriptors: *Pesticide residues, *Toxicity, Stan-*Herbicides, Aquatic weed control, Lotic environment, Lentic environment, Estuaries, Safety, Regulation, Potable water, 2-4-D, Crops, 2-4-5-T, *Water quality standards. Identifiers: *Herbicide registration.

Toxicology data, including 90-day feeding for two species of mammals, and residue data for irrigated crops, meat, poultry, milk, eggs, fish, shellfish, and potable water are required for registration of each aquatic herbicide. Separate protocols will probably be necessary for still waters, flowing waters, and tidal estuaries because of divergent environmental conditions. If herbicide residues are expected, toxicology data must be furnished to support safety of the residues. Residue clearance for USDA registration can be obtained by requesting the USDA to register it as a nonfood use or petition for an FDA regulation setting a tolerance or exemption from requirement of a tolerance. A nonfood use involves application remote from food crops where there is no reasonable expectancy of residues; this may include some aquatic uses. If used for irrigation, residue data must support the use; water should be monitored downstream and if residues are indicated, crop analysis should be made to determine residue tolerances. A March 1968 Public Health Service bulletin updated drinking water standards to include 2,4-D, 2,4,5-T, and 2,4,5,-TP and presented guidelines for water control authorities. Legislaguidelines for water control authorities. Legisla-tive jurisdiction for pesticide tolerance in potable water was unresolved. (See also W75-08289) (Buchanan-Davidson--Wisconsin)

DISSIPATION OF RESIDUES OF PHENOXY HERBICIDES APPLIED FOR WATER MILFOIL CONTROL IN LARGE RESERVOIRS,

Tennessee Valley Authority, Muscle Shoals, Ala. For primary bibliographic entry see Field 5B. W75-11198

CHEMICAL CONTROL OF EGERIA DENSA, Agricultural Research Service, Fort Lauderdale,

R. D. Blackburn.

In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways

Experiment Station, Vicksburg, Mississippi, p 43-51, August 1974. 3 tab, 11 ref.

Descriptors: *Submerged plants, *Herbicides, *Aquatic weed control, *Chemcontrol, Diquat, 2-6-Dichlobenil, Copper, Application methods, Toxicity, Fish, Rates of application, Taxonomy Identifiers: *Egeria densa, Brazilian elodea, En-

The taxonomic features of Egeria densa are described. The effects of several commonly used herbicides on Egeria were studied. In the laboratory endothall (amine salt) was more effective than potassium and dihydroxy aluminum salts. Addition of copper to endothall increased the effective-ness of both herbicides. Diquat alone or with a copper amine complex was very effective. Water temperature during application may be important Diquat gave good control in growth pools. Addition of endothall or copper to diquat had no advantage. Endothall (amine salt) was effective on Egeria but toxic to fish. Endothall (potassium and dihydroxy aluminum salts) were safe for fish but did not control Egeria. Copper plus endothall in-creased the effectiveness of both. Copper partially controlled Egeria, was toxic to fish, and regrowth was rapid. In field trials, diquat partially controlled Egeria; the diquat-copper complex gave excellent control; but potassium endothall plus diquat did not increase activity. Endothall (amine salt) was the most effective and endothall (TD-1874) more effective than the aluminum and potassium salts. An endothall controlled-release formulation was more effective on Egeria and less toxic to fish than regular formulations. Dichlobenil did not control Egeria but delayed regrowth when applied after diquat. (See also W75-08289) (Buchanan-Davidson--Wisconsin) W75-11199

FIELD TESTING OF AQUATIC HERBICIDES FOR CONTROL OF EGERIA DENSA, University of Southwestern Louisiana, Lafayette.

Dept. of Plant Industry. J. R. Barry. In: Proceedings, Research Planning Conference

on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 53-60, August 1974. 4 tab.

Descriptors: *Aquatic weed control, *Herbicides, *Laboratory tests, *On-site investigations, Diquat, Rates of application, Water temperature. Jaqua, Kates of Application, where temperature, identifiers: Egeria densa, Brazilian elodea, Black Lake(La), Lake Martin(La), K-lox, Fenac, 3M System E, TD-1874, TD-1929, SD-16389, Compound K, Triazine, Florida elodea, Hydrilla verpound K, Triazine, Florida elodea, Hydrilla elodea, Hydrilla

Field testing of promising herbicides during previous tests was conducted in Lake Martin near Lafayette, Louisiana. In one test diquat and diquat in a tank mix including copper hydroxide triethanolamine complex (K-lox) were most active in the control of Egeria densa, followed by endothall derivatives TD-1874 and TD-1929. gave less protection than when mixed with diquat. Fenac gave poor results which were inconsistent with prior pool and field studies. The 3M System E formulation was of no practical value for Egeria control. In another test an experimental copper complex formulation containing 8% copper (Compound K) was cost effective against Egeria. wed by diquat + K-lox, diquat + compound K, K-lox, and diquat. Effective control of Egeria in field tests could thus be achieved with at least two herbicides. SD-16389, an experimental triazine, received the lowest rating, which was inconsistent with pool studies, perhaps due to dilution factors. Further testing of SD-16389 will be conducted under field conditions to determine if effective rates and/or application techniques may be developed to provide the control shown in pool tests. A new invasion of Hydrilla verticillata in Louisiana was discovered on July 1973 in Spanish Lake near New Iberia. (See also W75-08289) (Buchanan-Davidson--Wisconsin) W75-11200

AQUATIC PLANT CONTROL USING HERBI-CIDES IN A LARGE POTABLE WATER SUPPLY, Virginia Polytechnic Inst. and State Univ., Blacksburg, Dept. of Fisheries and Wildlife

Sciences

B. Schreck, C. R. Berry, R. J. Strange, S. L.

Van Horn, and R. V. Corning. In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 61-70, August 1974. 5 fig.

Descriptors: *Impoundments, *Potable water, *Aquatic weed control, *Herbicides, Diquat, *Virginia, Comparative productivity, Fish, Rates of application, Dispersion, Application methods, Pesticide residues, Bottom sediments, Reservoirs, Oxygen.

Identifiers: *Chickahominy Reservoir(Va). *Walker's Dam Impoundment(Va), Newport News(Va), Coontail, Duckweed, Egeria densa, Brazilian elodea, Potassium endothall, Lyngbya, Ceratophyllum.

In July 1973, flowing water and still water quadrants of Chickahominy Reservoir (Walker's Dam Impoundment) in Virginia, a potable water supply for Newport News, were treated with nat dibromide and potassium endothall to control Brazilian elodea (Egeria densa). The effects on biological, chemical, and physical parameters of the ecosystem; extent of weed eradication; and herbicide physical and biological behavior were investigated. Rhodamine B indicated limited water movement. Nitrates, nitrites, pH, total phosphates, orthophosphates, calcium, magnesium, hardness and alkalinity did not change, but oxygen concentration increased steadily in weeded areas. Light extinction decreased. Phytoplankton primary productivity was im-mediately depressed, then increased steadily. Fish were not killed or eliminated. Closing the reservoir to human consumptive uses for 14 days was enough for the chemicals to dissipate. Herbicide concentrations and chemical oxygen demands in Egeria, coontail, duckweed, algae, bluegills, golden shiners, bass, and hydrosoils were being determined and dynamics of uptake and decline in water, plants, and sediment simulated. Visual ob-servations and aerial photographs were made of plant dieoff. Duckweed surface elimination was an index of Egeria eradication. Egeria and coontail declined but algae increased following treatment. The treatment was successful and acute detrimental environmental impacts were not evident. (See also W75-08289) (Buchanan-Davidson--Wisconsin) W75-11201

BIOLOGICAL CONTROL OF ALLIGATOR WEED, 1959-1972,

Agricultural Research Service, Beltsville, Md. J. R. Coulson.

In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 71-74, August 1974.

Descriptors: *Aquatic weed control, *Biocontrol, *Alligatorweed, Insects, *South Carolina, Overwintering sites, Reservoirs, Plant populations, Succession.

Identifiers: *Agasicles hygrophila, Columbia(SC), Jim Woodruff Reservoir(SC), Eurasian water mil-foil, Giant cutgrass, Hydrilla, Limnophylla.

The biological control of alligatorweed by Agasicles hygrophila was evaluated. Agasicles can over-winter as far north as Columbia, South Carolina and seems to be capable of reducing alligatorweed to a lesser economic or noxious role in the environment. There are insecticides which can control but not eradicate Agasicles; however this will probably never be necessary as its populations will probably vary with the food supply. At the Jim Woodruff Reservoir treatment of alligator weed caused water hyacinths, Eurasian water milfoil, Hydrilla, Limnophylla, catails, and giant cutgrass to increase. Thus a modification in the aquatic ecosystem tended toward increased diversity in the plant community but little improvement in the balance between producer and consumer organisms because of the pest potential of the invading plant species. In an ecosystem with several introduced weeds competing for space but without a complex of natural enemies, control efforts toward one species, if successful, can mean ex-pansion of one or more of the others. A total pest management program for aquatic weeds is needed. Resources currently available for biological control of weeds limit this approach. (See also W75-08289) (Buchanan-Davidson--Wisconsin) W75-11202

CONTROL OF EURASIAN BIOLOGICAL WATER MILFOIL, Agricultural Research Service, Gainesville, Fla.

Biological Control Lab For primary bibliographic entry see Field 4A. W75-11203

INTEGRATED CONTROLS ON NOXIOUS

AQUATIC PLANTS, Texas Parks and Wildlife Dept., San Antonio. Statewide Noxious Vegetation Control Program. L. V. Guerra.

In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 85-87. August 1974.

*Integrated control *Aquatic weed control, Biocontrol, Insects, Alligatorweed, Overwintering sites, Water hyacinth, 2-4-D, Floating plants, Submerged plants, Chem-control, Copper sulfate, Mechanical control, *Texas, Harvesting, Succession, Chara, Application methods, Rates of application

Identifiers: Eurasian water milfoil, Coontail, Egeria, Elodea, Flea beetles, Water hyacinth weevils, Cabomba, Water lilies, Bladderwort, 2-4-D BEE, Aqua Kleen 20.

The program of integrated control of noxious aquatic plants in Texas involves chemical and biological methods. Mechanical methods proved to be expensive; use of the fiber, protein, and residue as chicken feed was unfeasible; plants grew back in 43 days, and harvested plants were replaced by hardier, more chemically resistant plants. Flea beetles have been used on alligatorweed and water hyacinth weevils on water hyacinths. Establishment of permanent brood stock colonies of these insects near Brownsville and possibly San Marcos are planned. Dramatic results have been obtained with chemicals in Caddo Lake in northeast Texas where the main boat roads were blocked by white and yellow water lilies, milfoil, bladderwort, coontail, cabomba, and elodea. Granulated 2,4-dichlorophenoxy acetic acid butoxyethanol ester (2,4-D BEE) was effective against broad leaf plants, but egeria, chara, and cabomba had a natural partial resistance. Treatment of these plants under phytotoxic stress with copper sulfate gave excellent results. A second application of 2,4-D BEE was necessary in areas subject to flooding, high turbidity, and a flushing effect from high currents; the gradual decomposition of the plants and nutrient release improved fishing. Five watersheds are now under a minimal maintenance program, and work is progressing on others. (See also W75-08289) (Buchanan-Davidson--Wisconsin)

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

UNISEX STUDIES ON THE WHITE AMUR. Bureau of Sport Fisheries and Wildlife, Stuttgart, Ark. Fish Farming Experiment Station. For primary bibliographic entry see Field 5C.

UTILIZATION OF PHYTOPATHOGENS AS BIOCONTROLS FOR AQUATIC WEEDS, Florida Univ., Gainesville. Dept. of Plant Patholo-

T. E. Freeman, F. W. Zettler, and R. Charudattan. In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 97-102, August 1974, 12 ref.

Descriptors: *Biocontrol, *Aquatic weed control, Plant diseases, Water hyacinth, Alligatorweed, Southeast United States, Florida, Blights, Rots, Spots, Hosts, Plant pathology, Viruses, Subtropic. Identifiers: *Rhizoctonia solani, *Sepholosporium zonatum, Eurasian water milfoil, Hydrilla, Phthium, Sclerotium, Penicillium

The progress of research at the University of Florida in the study of plant diseases for the biological control of noxious aquatic plants, espe-cially water hyacinth, Hydrilla, alligatorweed, and Eurasian water milfoil is described. Because many of these plants are not native to the United States, disease surveys were made in much of southeastern United States, the Caribbean Islands, South and Central America, and India. Several diseases have been found to affect water hyacinth. Of the leafspots, Cephalosporium zonatum has the highest potential. Indian workers believed Alternaria eichhorniae had potential, but Florida isolates were not aggressive pathogens; Indian iso-lates are being studied. Three general blights have also been studied; Rhizoctonia solani is especially promising despite its wide host range. A severe root and crown rot was discovered which may be caused by a complex of organisms. The five dis-eases against Hydrilla were the first ever recorded, and their potential is being assessed. A stunt disease of alligatorweed caused by a virus that may belong to the beet-yellows group has been found, but transmission of the causal agent has been difficult. Certain isolates of R. solani will also affect Hydrilla and alligatorweed. No disease for Eurasian water milfoil has yet been isolated. (See also W75-08289) (Buchanan-Davidson-W75-11206

TRANSPLANTING SEA GRASS IN MISSISSIPPI

Gulf Coast Research Lab., Ocean Springs, Miss. For primary bibliographic entry see Field 4A. W75-11207

CO2 LASER EFFECTS ON WATER HYACINTH,

Army Engineer Waterways Experiment Station, Vicksburg, Miss. J. G. Collins.

In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p 111-118, August 1974. 7 fig.

Descriptors: *Aquatic weed control, *Irradiation, *Water hyacinth, Radiation, *Louisiana, Water pollution control. Identifiers: *Laser, *Carbon dioxide laser, Bayou

Gauche(La), Lake Concordia(La),

The objective in Bayou Gauche near New Orleans was to determine how the laser system would function in an outdoor environment. There was damage from the irradiation, but no strong correla-tion between degree of damage and irradiation level. In Lake Concordia, Louisiana, the objective was to establish the effects of carbon dioxide laser radiation on water hyacinths. Biomass decreased with increased irradiation but little additional damage occurred above a level of 30-40 joules/sq cm. Irradiation may have a prolonged effect since the biomass decreased progressively as a function of time following irradiation. During the first two weeks after irradiation there was no effect on propagation rates, but then there was a decrease in propagation rates with an increase in irradiation and time. There was no evidence of actual plant kill. Coverage of plot areas appeared to decrease with an increase in irradiation and time following irradiation. A cost-effectiveness evaluation of the laser as a control device is needed. Tests should be conducted at the beginning and during the height of the growing season on plants with a wider size range using radiation levels below 30 joules/sq cm. W75-08289) (Buchanan-Davidson-

OPERATIONS PLATFORMS.

Army Engineer Waterways Experiment Station, Vicksburg, Miss. For primary bibliographic entry see Field 4A. W75-11210

HERBICIDE CHEMICALS AND THEIR EF-FECT ON THE AQUATIC ENVIRONMENT, Bureau of Sport Fisheries and Wildlife, Washington, D.C. Div. of Fishery Research. For primary bibliographic entry see Field 5C. W75-11211

REGISTRATION OF AQUATIC HERBICIDES, Office of the Chief of Engineers (Army), Washing-For primary bibliographic entry see Field 4A. W75-11212

DISSIPATION OF RESIDUES OF PHENOXY HERBICIDES APPLIED TO THE WATERSHED, Oregon State Univ., Corvallis. School of Forestry For primary bibliographic entry see Field 5B.

DISSIPATION OF PHENOXY HERBICIDES AP-PLIED TO RIPARIAN VEGETATION. Pennsylvania State Univ., University Park. School

of Forestry. For primary bibliographic entry see Field 5B. W75-11214

WATER HYACINTH RESEARCH IN PUERTO

RICO, Army Engineer Waterways Experiment Station, Vicksburg, Miss.

In: Proceedings, Research Planning Conference on Integrated Systems of Aquatic Plant Control, October 29-30, 1973, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, p F3-F24, August 1974. 3 fig, 7 tab.

Descriptors: *Water hyacinth, *Puerto Rice, *Aquatic weed control, *Biocontrol, Growth rates, Snails, Productivity, Biomass, Research and development. Identifiers: *Brazilian snails, Pomacea australis,

Water lettuce

Water hyacinths are the most troublesome aquatic weed in Puerto Rico. Hyacinth reproduction rate at three different natural sites varied from 0.9 to 8.6 plants per day (48.3 to 587.4 g/day) but the rate of production of daughter plants at all three sites rose to a maximum during a 15 to 40 day period then declined. Sometime within that period, plant material covered the water surface, suggesting that crowding inhibited production of daughter plants. Only water pH varied between plots. Disturbing the plants had some effect on productivity, but the extent was not determined. In laboratory tests, productivity of plants from the three areas varied in tap water, but was the same when fertilized. When hyacinth and Brazilian snails (Pomacea australis) were placed in tanks together, the mass of hyacinths decreased while the mass and number of snails increased, although their individual weights remained approximately the same. Snails consumed water lettuce faster than hyacinths. When both were present, snails consumed the lettuce first, then rapidly consumed the hyacinths. The snails eat a variety of green plant material, thus are not specific to hyacinths. The snails offer a promising potential for water hyacinth control. (See also (Buchanan-Davidson--Wisconsin) W75-08289) W75-11215

INS'

TY

Ariz

Res

Join Va.

mer Wat

For dus

Coz

Riv

Tra

and Me

per

Bra Co:

war 198 bas the

res

A

11

De *E *B ba tai sh

tra lat Pr W Id

To

pl U

WATER LEVEL MANIPULATION: A TOOL FOR AQUATIC WEED CONTROL, Louisiana Wild Life and Fisheries Commission.

Tioga. Aquatic Weed Research. For primary bibliographic entry see Field 4A. W75-11216

THE AQUATIC WEED PROBLEM, 1, IDENTIFI. CATION.

Victoria State Coll., Carlton (Australia). Dept. of Plant Physiology. For primary bibliographic entry see Field 2I. W75-11220

ELECTROLYTIC CONTROL OF ALGAE,

Calcutta Metropolitan Development Authority For primary bibliographic entry see Field 5F. W75-11228

ALGAE CONTROL IN NORTHWEST RESER-VOIRS.

Seattle Dept. of Water, Wash. J. E. Courchene, and J. D. Chapman. Journal of the American Water Works Association, Vol 6, No 3, p 127-130, 1975. 3 fig, 3 ref.

Descriptors: *Algal control, *Pacific Northwest US, *Reservoirs, Application methods, Rates of application, Water storage, Potable water, Algi-cides, Copper sulfate, Chlorine, Chlorination, Safety factors, Hazards, Fish. Identifiers: Storage reservoirs, Distribution reser-

voirs, Light exclusion.

Several methods of nuisance algae control in Pacific Northwest water supply reservoirs are described. Knowledge of the proper algicide to use, when, how much, and how to apply it, and of the water to be treated is essential. Copper sulfate was found to be the most satisfactory algicide. Factors influencing the amount of copper sulfate to be used, susceptibility of organisms, and effects of its usage are discussed. Chlorine may be used in conjunction with copper sulfate. The rates and methods of application are determined by reservoir size, available equipment, and cost. Rapid dissolution and uniform application are essential. Workers should avoid accidental ingestion or inhalation. New reservoirs should be cleared of vegetation and organic matter to eliminate nutrients for algal growth. Preferably distribution reservoirs should be covered to exclude sunlight to prevent proliferation of algae. Use of gas chlorination is cheaper than copper sulfate or hypochlorites. With a continuous program of sampling, identification, and treatment, water supplies should remain clean and palatable. (Buchanan-Davidson-Wisconsin)

INSTITUTIONAL ARRANGEMENTS FOR REDUCING CONFLICT OVER WATER QUALI-INSTITUTIONAL TY IN INTERNATIONAL RIVERS,

Arizona Univ., Tucson. Inst. of Government For primary bibliographic entry see Field 6E. W75-11242

TRANSLATIONS ON ENVIRONMENTAL QUALITY, NO. 33.
Joint Publications Research Service, Arlington,

Report JPRS 62033, May 20, 1974. 36 p.

Descriptors: *Foreign countries, *Pollution abatement, *Pollutants, *Water pollution control, Water pollution sources, Environmental effects, Potable water, Water supply development, Foreign waters, Insecticides, Mexico, DDT, Industrial wastes, Air pollution, Water treatment, Recycling.

Recycling.
Identifiers: *Brazil, *USSR, *West Germany,
Coatzacoalco River(Mexico), Caspian Sea, Vazu-River(USSR), Moscow(USSR), River(USSR), Ural River(USSR).

Translations of newspaper articles and press com mentary on environmental pollution and its effects, and pollution control technology, organizations, and programs are presented. The 13 articles and 3 news briefs included originate from Brazil, Mexico, the USSR, and West Germany during the period from October 1973 - May 1974. Topics in-clude concern over the harmful effects of DDT in Brazil; various industries accused of polluting the Coatzacoalco River, Mexico; praise of the Volkswagen de Mexico for its efforts in the field of environmental pollution control; a plan to control the evaporation of the Caspian Sea; intentions to tap the Vazuza River in order to increase drinking water supplies for Moscow; and the elimination by 1980 of industrial pollution of the Volga and Ural basins by Soviet technology. Other articles from the USSR discuss principles of classifying documents on nature conservation and natural resources; the improvement of the Krasnovodsk Oil Refinery waste treatment facilities and of the purity indicators at the Kalinin aeration station; the establishment of a commission on the protection of nature; and air and water purification methods for the steel industry. The West German article summarizes a series of tests of ideas for combating environmental pollution. (Becker-W75-11246

AN ECONOMIC ANALYSIS OF THE POLLU-TION PROBLEMS IN THE COLORADO RIVER BASIN: THE UPPER MAIN STEM SUB-BASIN,

Colorado Univ., Boulder. C. W. Howe, J. F. Kreider, and B. Udis Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as COM-74-1311, \$8.50 in paper copy, \$2.25 in microfiche. Report No EDA-OER-74-308, October 1972, 238 p, 25 fig, 38 tab, 60 ref, 2 append. OER-351-G-71-

*Industrial production, *Environmental effects, *Colorado River Basin, *Regional development, *Input-output analysis, "Computer models, Salinity, Air pollution, River basins, Colorado, Colorado River, Rocky Moun-tain Region, Computer programs, Planning, Oil shales, Recreation, Industries, Agriculture, Water transfer, Utah, Mining, Livestock, Human popu-lation, Employment, Lumbering, Powerplants, Projections, Hydrologic aspects, Groundwater, Projections

Identifiers: FORTRAN models, Upper-Colorado River sub-basins, Eastern Rocky Mountains.

To permit planners to test some environmental implication of alternative growth patterns for the Upper Main Stem sub-basin of the Colorado River, a set of models relating economic activities to air and water demand and quality are developed. This interim report describes a model which has three components: (1) an input-output model of the sub-basin economy, (2) an air diffusion model projecting the airborne distribution of residuals over the region, and (3) a hydrologicsalinity model to trace the monthly surface and groundwater flows and salt flows through the system. Included in the analysis are the agriculture, forestry, mining, energy, manufacturing, tertiary industries, and contract construction aspects of the economy. FORTRAN computer programs for hydro-salinity, residuals generation and pollu-tant dispersion aid in modeling the relationships between economic activities and environmental implications. The hydro-salinity model has an economic buffer which computes water withdrawal demands, consumptive uses and waste loads, and inputs these data into the combined hydro-salinity model. The Air Pollution Generation and Dispersion Model (APGDM) program computes air-borne residuals generation rates and ground-level pollutant patterns, corresponding to the level of economic activity determined by field surveys or by projections of the input-output model. Use conflicts can be identified through such sets of models. (See also W75-07377) (Becker-Wisconsin) W75-11247

ECONOMIC ANALYSIS OF EFFLUE GUIDELINES: MEAT PACKING INDUSTRY, EFFLUENT Development Planning and Research Associates,

Inc., Manhattan, Kans

R. E. Seltzer, and J. K. Allwood. Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as PB-235 303, \$6.25 in paper copy, \$2.25 in microfiche. Report No EPA-230/2-74-017, May 1974. 164 p, 13 fig, 49 tab. 68-01-1533.

Descriptors: *Food processing industry, *Effluents, *Economic impact, *Water pollution control, *Pollution abatement, Pricing, Waste water treatment, Costs, Foreign trade, Social impact, Investment, Water quality standards, Profit, Employment, Facilities, Industrial wastes.
Identifiers: *Meat packing industry, *Effluent

The economic impact of effluent guidelines is assessed for meat packing houses and for slaughterhouses according to size and characteristics. The meat packing and slaughtering industry is characterized by high dollar sales volume and low sales dollar earnings—the after tax earnings in 1972 were 0.8% on sales. Increased costs associated with the implementation of effluent guidelines must be (1) absorbed by meat packers, (2) passed forward to consumers as higher meat prices, (3) passed backwards to suppliers as lower prices for livestock, or (4) some combination of these options; margins in the industry are narrow, so presumably cost increases associated with effluent controls will be passed on primarily as higher retail meat prices. The economic impact analysis, utiliz-ing data developed on industry segments, financial profiles, price effects, and pollution abatement technology and costs, includes effects on pricing, financing, production, employment, community and foreign trade. Plants discharging into mu-nicipal sewers will be unaffected by these guidelines. For all other plants, price increases required to meet 1983 standards would be 0.3-0.4% for large, 0.4-0.7% for medium and 1.1-1.25% for small. Plant closures would be greatest among small plants and would affect slaughter-only plants more than meat packers. (Becker-Wisconsin) W75-11249

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES. FERROALLOYS INDUSTRY.

Kearney (A. T.) and Co., Inc., Chicago, Ill. Available from the National Technical Information Service, Springfield, Va. 22161, as PB-234 045, \$5.25 in paper copy, \$2.25 in microfiche. Report No EPA-230/2-74-009, June 1974. 131 p, 6 fig, 48 tab. 68-01-1545.

Descriptors: *Air pollution, *Effluents, *Water pollution control, *Economic impact, *Iron alloys, *Pollution abatement, *Industrial wastes, Water quality standards, Steel, Waste water treatment, Investment, Operating costs, Social impact, Pricing, Facilities, Foreign trade, Costs, Cooling ing, Facilitaes, towers, Profit. Identifiers: *Ferroalloys industry, *Effluent

Based on the analyzed data and interviews with ferroalloy manufacturers, it is believed that the proposed water pollution control standards (1983 standards--Best Practicable Technology) will have no significant effect on production levels or plant closings in the ferroalloy industry. The analysis of the manufacturing of the four major ferroalloysferromanganese, ferrosilicon, ferrochromium, and silico-manganese--includes nine companies, operating 22 plants. To assess the impact of proposed effluent guidelines the following measures were made: (1) the financial impact on the industry as a whole according to several indices, (2) the same analyses on groups of companies, and (3) the impact on prices of ferroalloys based on the maintenance of the industry's historical average level of profitability before taxes. It was found that 14 of the 22 plants already have in operation the equipment necessary to meet 1977 standards and will require only a small investment to meet 1983 standards. For the eight plants needing additional water pollution abatement equipment, a price increase of 1.0-1.3% for 1977 standards and 2.2-2.4% for 1983 standards is necessary to maintain the industry current return on total assets. Other considerations in the future of the ferroalloys industry include air pollution control costs and foreign competition. (Becker-Wisconsin) W75-11250

THE WATER INDUSTRY IN TRANSITION, National Water Council, London (England). For primary bibliographic entry see Field 3E. W75-11252

THE ECONOMIC IMPACT OF POLLUTION ABATEMENT: THE CASE OF WATER POLLU-TION BY DEGRADABLE ORGANIC MATTER, Centraal Planbureau, The Hague (Netherlands).

Occasional Papers No 1, 1973. 71 p, 7 tab, 3 ap-

Descriptors: *Economic impact, *Pollution abatement, *Organic matter, *Eutrophication, *Inputoutput analysis, Decomposing organic matter, Water pollution control, Legislation, Europe, Mathematical models, Financing, Gross National Product, Employment, Pollution taxes(Charges), Water quality, Foreign trade. Identifiers: *Netherlands.

A measurement of the economic consequences of the abatement of water pollution, specifically by degradable organic matter, using direct and indirect policy instruments and a closed input-output model is presented. The input-output model takes into account five sectors of the economy: environmental, which is of primary interest here; agricultural; industrial; construction; and service; but does not include branches of a sector, and therefore can give only global information on an entire sector. The starting point of the model is that environmental policies will create certain activities which are primarily directed at preventing or reducing pollution. The quality standard and the time period for achieving the standard, two important parameters in the model, affect the nature of the expenditure effects and the price effects. accordance with The Netherlands 1971 Act on Pollution of Surface Waters, the 'polluter pays' principle is assumed. Also discussed are degradable organic pollution and its alleviation by the

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

methods suggested by results from the model. The limited availability of adequate statistical data on the national level, and the segmentation of the larger topic of water pollution control into the specific area of water pollution by degradable organic matter leave the results of the model study clouded. (Becker-Wisconsin)

PITLESS ADAPTERS: EMPHASIS ON SANITA-

Environmental Protection Agency, Washington, D.C. Div. of Water Supply.
For primary bibliographic entry see Field 8C. W75-11258

CONOCO TECHNOLOGY CURBS PRODUC-TION POLLUTION, Continental Oil Co., Houston, Tex.

C. L. Million.

Petroleum Engineer, Vol 45, No 9, p 42-46, August, 1973. 3 fig, 3 tab.

Descriptors: *Pollution abatement, Technology, Design, Methodology, Oil industry, Oil pollution, Industrial production, Water pollution, Air pollution, Pollutant identification, Water pollution con-

Potential pollution causes can be controlled by properly applied technology, though in some cases the technology has not yet become inexpensive enough to be practically applied. Some new technology is needed to meet air emission standards. A technique of evaluating pollution risk of the major subsystems of an overall production system is presented. Specific suggestions and examples of this applied technology are given. (Bradbeer-NWWA)

WORKSHOP ON COMPUTER-AIDED DESIGN AND SIMULATION OF WASTE TREATMENT

Protection Service, Environmental (Ontario). Water Pollution Control Directorate. For primary bibliographic entry see Field 5D. W75-11338

B(RITISH) C(OLUMBIA) PRESSES FOR FOREST INDUSTRIES CLEAN-UP.

Water and Pollution Control, Vol 113, No 6, p 21-22. June. 1975. 3 illus.

Descriptors: *Water pollution control, *Pulp and paper industry, *Canada, Foreign countries, Legislation, Pollution abatement, Costs, Wastes water(Pollution), Water pollution sources, Industrial wastes, Wastes, Water pollution, Wood wastes, Sulfite liquors.

Identifiers: *British Columbia, Forest industries, Sulfite mills, Floating debris.

Millions of dollars are being spent by British Columbia's forest industry to meet the provincial government's policies on water pollution. The pollution regulations are aimed at controlling waste water discharges and containing floating debris (logging residues and logs) in the waterways. Har-dest hit has been the province's pulp and paper industry. The sulfite mills, built at the turn of the century when environmental considerations were not an issue, bear the heaviest costs. Pollution control programs for British Columbia's two sulfite mills, Candian Cellulose Co. (Prince Ru-pert) and Rayonier Canada Ltd. (Port Alice), are estimated at \$95 million. The introduction of pollu tion abatement equipment at these mills will reduce foaming in the receiving waters, reduce fiber losses, and lower the concentration of pollu-tants in the waste discharges. Current legislation controlling water pollution is already under review by the provincial government. (Witt-IPC) W75-11350

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOL. II. ASPECTS OF COMPUTATION RAND Corp., Santa Monica, Calif. For primary bibliographic entry see Field 2L.

W75-10900

RELATIVE IMPORTANCE OF DECISION VARIABLES IN FLOOD FREQUENCY ANALY-

SIS, IBM Watson Research Center, Yorktown Heights, For primary bibliographic entry see Field 4A. W75-10929

PRESCRIPTIVE ECONOMIC MODELS FOR NONSTRUCTURAL FLOOD CONTROL,

Cornell Univ., Ithaca, N.Y. For primary bibliographic entry see Field 6F. W75-11060

A MATHEMATICAL MODEL FOR OPTIMAL WASTE LOAD ALLOCATIONS,

Oklahoma Univ., Norman. For primary bibliographic entry see Field 5G. W75-11102

SYSTEMS AND COMPUTER WATER RESOURCES.

Polytechnic Institute of New York, Brooklyn; and Illinois Univ., Chicago. G. Bugliarello, and F. J. Gunther.

Developments in Water Science 1. Elsevier Scientific Publishing Company, Amsterdam, The Netherlands, 1974. 202 p, 38 fig, 16 tab, 210 ref, 9 append. \$17.30.

Descriptors: *Water resources, *Technology, **Computers, Methodology, Decision making, Management, Systems analysis, Mathematical models, Groundwater, Surface waters, Water utilization, Optimization, Simulation analysis, Computer programs, *Reviews, *Bibliographies.
Identifiers: Process control, Hardware, Software, Data acquisition.

The advent of the computer has provided water resources technology with a powerfully efficient tool for the design, planning, management, and operation of water systems. Presented is a stateof-the-art overview of some of the principal considerations in the use of computer systems for water resource practitioners and decision makers. Important trends and issues having impact upon water resources technology are discussed under the general terms of hardware, software, and methodology; focused upon are major areas of computer application in water resources, including data acquisition and management, process control, and system analysis and design. These computer tasks are examined in the contexts of surface water, ground water, and water utilization systems. The methods of dynamic programming, Monte Carlo, Simulation analysis, optimal control theory, relaxation, finite difference, and finite ele-ment are considered in the use of computers for surface and ground water systems. The overall issue is whether there should be national possibly international strategies governing the use of computers in water resources. It is recommended that guidelines or agreements be derived in order to establish a comprehensive computer strategy for water resources. Existing and potential principal elements of a structure of the interface between computer systems and water resources technology

are considered, i.e., data banks for storage, management and dissemination of information, and a set of problem-oriented computer language.
(Bell-Cornell) W75-11174

IMPROVED DESIGN OF DISTRIBUTION NET-WORKS BY MINIMUM ROUTE.

Nihon Suido Consultants Co., Tokyo (Japan). For primary bibliographic entry see Field 4A. W75-11175

TREATMENT PLANT MONITORING PRO-GRAMS: A PRELIMINARY ANALYSIS.

Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering. For primary bibliographic entry see Field 5D. W75-11176

THE LOUISIANA ENVIRONMENTAL. MANAGEMENT SYSTEM AND ITS UTILITY IN WATER RESOURCE PLANNING, Louisiana State Univ., Baton Rouge. Div. of En-

gineering Research. For primary bibliographic entry see Field 5G. W75-11177

STRATEGIC APPROACH TO ESTUARINE EN-VIRONMENTAL MANAGEMENT,

Oregon State Univ., Corvallis. Dept. of Civil Engineering. For primary bibliographic entry see Field 2L. W75-11179

DISTRIBUTION-SYSTEM OPERATION ANAL-YSIS MODEL,

Omaha Metropolitan Utilities District, Nebr. Services Dept. For primary bibliographic entry see Field 5D. W75-11180

SIMULATION OF MANAGEMENT POLICIES,

Virginia State Water Control Board, Richmond. For primary bibliographic entry see Field 5G. W75-11181

COMPUTER ANALYSIS OF WATER-DIS-TRIBUTION SYSTEMS, Springfield Dept. of Water, Light and Power, Ill.

For primary bibliographic entry see Field 4A. W75-11182

ADVANCED TECHNIQUES IN THE MATHE-MATICAL MODELING OF WATER-DISTRIBU-

Beck (R. W.) and Associates, Seattle, Wash. For primary bibliographic entry see Field 4A. W75-11183

MACROSCOPIC DISTRIBUTION-SYSTEM MODELING,

General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div. For primary bibliographic entry see Field 4A W75-11185

AN ECONOMIC ANALYSIS OF THE POLLU-TION PROBLEMS IN THE COLORADO RIVER BASIN: THE UPPER MAIN STEM SUB-BASIN, Colorado Univ., Boulder.

For primary bibliographic entry see Field 5G. W75-11247

COVA

6B. H

TAX B Kentuc C. M. V Availa tion S Resear ref. OV

Descri constr Econo Identif land(K

> (Lake base in

> other g

the tw

flood i

group

counti

ance n change from i data a transa sessed value showe more i voir t greate found results caused recove

the tax

SOCI DEVE FOR I POST Utah : Resear Availa tion S 519, 5 Resear

tion, *Utah values Energ ject(U

3408)(

and se Weber goals o гестеа tant ch and be structi

were a

6B. Evaluation Process

COVARIANCE ANALYSIS OF RESERVOIR DEVELOPMENT EFFECTS ON PROPERTY

Kentucky Water Resources Inst., Lexington

C. M. Vaughan, Jr.

Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 582, \$6.25 in paper copy, \$2.25 in microfiche. Research Report No 4, 1967. 144 p, 4 fig, 58 tab, 63 ref. OWRT A-006-KY, 14-01-0001-1085.

Descriptors: Reservoirs, *Tax rates, Taxes, Flood plains, *Kentucky, *Property values, Reservoir construction, Benefits, Costs, Evaluation, Economics, *Statistical studies.

Identifiers: *Covariance analysis, Lake Cumber-

land(Kent).

This study tests the hypothesis that a reservoir (Lake Cumberland) has affected the property tax base in the three counties in which it is located so as to increase at a more rapid rate than that in two other groups of counties in the same area. One of wo other groups consisted of counties in the flood plain, downstream from the dam, the other group consists of counties adjacent to the first two groups. The study also seeks to evaluate the benefits to the property tax base in the flood-plain counties. The study uses the analysis of covariance model to test the hypothesis. Use of the analysis of covariance model separates the rate of change in property tax base in the affected area from in two other areas. The primary source of data are samples of rural and urban real estate transactions. Secondary data sources include assessed value of real property and estimated market value of real property. The statistical analysis showed the property tax base to be increasing more rapidly in the counties containing the reservoir than in the other groups of counties. The greatest increase in urban property sale values was found in a town in the flood plain. These statistical results suggest that the initial loss in the tax base land removed from the tax rolls was recovered in time through more rapid expansion in the tax base. (Huffsey-Kentucky) W75-10851

SOCIAL IMPACTS OF WATER RESOURCES DEVELOPMENTS AND THEIR IMPLICATION FOR URBAN AND RURAL DEVELOPMENT: A POST AUDIT ANALYSIS OF THE WEBER BASIN PROJECT IN UTAH,

Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.

Nesearch on Natural Resources.

W. H. Andrews, G. E. Madsen, and G. J. Legaz.

Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244
519, 57.00 in paper copy \$2.25 in microfiche.

Research Monograph No 4, December 1974 178 p, 54 tab, 3 fig, 59 ref, append. OWRT C-2192(No 308Y1)

Descriptors: *Social impact, Social change, Irriga-tion, Recreation, Flood control, Reservoirs, *Utah, Post-impoundment, Attitudes, *Social values, Social adjustment, *Urban sociology, Energy, Municipal water, Industrial water, Water demond Water, willingting, *Water Brein, Perdemand, Water utilization, *Weber Basin Project(Utah), *Post audit analysis.

A post-audit methodology, utilizing both primary and secondary data sources, was applied to the Weber Basin Project in Utah to identify original goals of the project, changes in goals and selected social impacts of the project. The major components were: municipal and industrial, irrigation, recreation, flood control, and power. The important changes occurred between the authorizing act and both later planning documents and post-con-struction use which were related to changing social conditions and priorities. Present social impacts were also identified. Important impacts of Weber water were: feelings of security associated with the assured, dependable supply, ability to provide for increased population, provide for late crops and gardens and recreational use. Among the negative impacts were hardness of the water, chlorine taste, and operation and maintenance costs. There was evidence that recreational impacts of the project were underestimated. Up to 1973, flood control benefits were estimated at \$1,230,000 using a Corps of Engineers method. There was also a low degree of anxiety concerning future flooding by the public. However, certain irrigation officials identified flood control problems associated with the project. Power usage by the project generally has been lower than predicted but sales of excess power have been greater than predicted. W75-10854

HUMAN OBSTACLES TO THE CONTROL OF THE HYDROLOGICAL CYCLE FOR THE

BENEFIT OF MAN, Technion - Israel Inst. of Tech. Haifa (Israel). Dept. of Agricultural Engineering. For primary bibliographic entry see Field 2A. W75-10866

AN ANALYSIS OF THE MOTOR-ROW CON-VERSION ISSUE OF COLORADO RIVER FLOAT TRIPS,

Arizona Univ., Tucson. Dept. of Watershed Management.

Arizona University, Tucson, Department of Watershed Management, MS Thesis, 1974. 171 p, 19 fig, 36 tab, 4 append, 33 ref.

Descriptors: *Environmental effects, *Colorado River, *Boating, *Balance of nature, *Watershed management, Recreation, Water utilization, Rivers, River regulation, National parks, National recreation areas, Water pollution control Identifiers: Motor-row issue

River float trips on the Colorado River through Marble and Grand Canyons dramatically increased within the last ten years, so much so that the National Park Service has decided to reduce the number of river trip participants and require all motorized trips to convert to oar-powered trips by 1977 to reduce the impact on the ecological system. These policies have become major management concerns identified as the motor-row issue which consists of four divisions; limitation of use, perception of wilderness, user agreement with conversion, and user preference for type of trip. Data were collected with self-administrated questionnaires distributed at one pre-trip and four post-trip sites. Results indicated that there was not a definitive positon of the user population regarding conversion, users are divided in their agreement with conversion policies and preference for type of trip. These results will yield definitive conclusions regarding conversion when the National Park Service defines the desired populations of participations through management goals and objectives. (McLachlan-Arizona) W75-10867

THE AWARENESS OF THE RELEVANT WATER RESOURCES LITERATURE BY THE PERSONNEL OF THE WISCONSIN DEPART-MENT OF NATURAL RESOURCES,

Wisconsin Univ., Madison. Library School. For primary bibliographic entry see Field 10C.

A CASE STUDY OF SOME ECONOMIC ASPECTS OF THE NATIONAL FLOOD INSURANCE PROGRAM,

Mississippi State Univ., Mississippi State. Div. of Business Research. For primary bibliographic entry see Field 6F.

FLOODPLAIN LAND-USE MANAGEMENT: AN APPLICATION OF OPERATIONS RESEARCH METHODOLOGY, Massachusetts Univ., Amherst. Dept. of Food and

Resource Economics.

For primary bibliographic entry see Field 6F.

THE ECONOMICS OF FLOOD INSURANCE: AN ANALYSIS OF THE NATIONAL FLOOD IN-SURANCE PROGRAM.

Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics. For primary bibliographic entry see Field 6F.

W75-11038

WATER APPLICATION PRACTICES AND LANDSCAPE ATTRIBUTES ASSOCIATED WITH RESIDENTIAL WATER CONSUMPTION, New Mexico State Univ., University Park. Dept. of Horticulture. For primary bibliographic entry see Field 3D.

A MATHEMATICAL MODEL FOR OPTIMAL WASTE LOAD ALLOCATIONS, Oklahoma Univ., Norman.

For primary bibliographic entry see Field 5G. W75-11102

LOUISIANA ENVIRONMENTAL. MANAGEMENT SYSTEM AND ITS UTILITY IN WATER RESOURCE PLANNING, Louisiana State Univ., Baton Rouge. Div. of En-

gineering Research.
For primary bibliographic entry see Field 5G. W75-11177

SIMULATION OF WATER MANAGEMENT POLICIES,

Virginia State Water Control Board, Richmond. For primary bibliographic entry see Field 5G. W75-11181

AN ECONOMIC ANALYSIS OF THE POLLU-TION PROBLEMS IN THE COLORADO RIVER BASIN: THE UPPER MAIN STEM SUB-BASIN, Colorado Univ., Boulder. For primary bibliographic entry see Field 5G.

ECONOMICS OF GREAT LAKES SHIPPING IN AN EXTENDED SEASON, Michigan Univ., Ann Arbor, Dept. of Naval Architecture and Marine Engineering. For primary bibliographic entry see Field 6C.

W75-11248

W75-11247

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: MEAT PACKING INDUSTRY, Development Planning and Research Associates, Inc., Manhattan, Kans For primary bibliographic entry see Field 5G. W75-11249

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES. FERROALLOYS INDUSTRY. Kearney (A. T.) and Co., Inc., Chicago, Ill. For primary bibliographic entry see Field 5G. W75-11250

NON-RENEWABLE. NON-ENERGY

RESOURCES, Leicester Univ (England). Public Sector Economics Research Centre. D. Pearce.

Environmental Economics Study Group Series 13, (1975). 5 p, 62 ref.

Field 6-WATER RESOURCES PLANNING

Group 6B—Evaluation Process

*Bibliographies, *Withdrawal, Descriptors: *Resource allocation, *Natural resources, *Mining, Economic impact, Economic life, Taxes, Metals, Forests, Dependable supply, Conservation, Recycling.
Identifiers: *Minerals, Resource depletion, Raw

materials

This bibliography, prepared by the Environmental Economics Study Group of Leicester University, England, contains 62 references. Included among the reference titles are the topics of optimal growth under depletion conditions, the economics of scarcity and growth, resource conservation, mineral reserves and resources, recent theory of exhaustible resources, extractive resources and taxation, intergenerational equity and exhaustible resources, and the life cycle of non-ferrous minerals. The period of 1931-1975 is included within the references. (Becker-Wisconsin) W75-11253

THE ECONOMIC IMPACT OF POLLUTION ABATEMENT: THE CASE OF WATER POLLU-TION BY DEGRADABLE ORGANIC MATTER, Centraal Planbureau, The Hague (Netherlands). For primary bibliographic entry see Field 5G. W75-11254

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

COVARIANCE ANALYSIS OF RESERVOIR DEVELOPMENT EFFECTS ON PROPERTY TAX BASE,

Kentucky Water Resources Inst., Lexingto For primary bibliographic entry see Field 6B. W75-10851

SUCCESSFUL IRRIGATION: PREPARATION, REALIZATION, EXPLORITATION, (SAVOIR IRRIGUER: PREPARATION, REALISATION, EXPLOITATION),

California Univ., Davis. Dept. of Irrigation For primary bibliographic entry see Field 3F. W75-10874

HIGH COSTS MODIFY SEWAGE PLANT EX-PANSION.

For primary bibliographic entry see Field 5D. W75-10993

COST EVALUATION OF WATERCOURSE MANAGEMENT IN ESSEX,

Cambridge Univ. (England). Dept. of Applied Biology.

For primary bibliographic entry see Field 5G. W75-11008

HOW TO ESTIMATE AND ESCALATE COSTS OF WASTEWATER EQUIPMENT. ICARUS Corp., Silver Spring, Md. For primary bibliographic entry see Field 5D. W75-11014

COST SHARING TO HELP CLEAN OUR WATERWAYS.

For primary bibliographic entry see Field 5G. W75-11023

THE ECONOMY OF VARIOUS METHODS FOR DEWATERING SLUDGE FROM BIOLOGICAL PURIFICATION (UEBER DIE WIRTSCHAFT-LICHKEIT VERSCHIEDENER VERFAHREN ZUR ENTWAESSERUNG- VON BIOLOGISCHEM KLAERSCHLAMM),

Uhde (Friedrich) G.m.b.H., Dortmund (West Germany).

For primary bibliographic entry see Field 5D. W75-11127

AN IMPLICIT APPROACH TO PRICING AGRICULTURAL WATER TRANSFERS TO URBAN USES,

Colorado State Univ., Fort Collins. Dept. of / gricultural Engineering.
For primary bibliographic entry see Field 4A.
W75-11178

ECONOMICS OF GREAT LAKES SHIPPING IN

AN EXTENDED SEASON,
Michigan Univ., Ann Arbor. Dept. of Naval
Architecture and Marine Engineering. H. Nowacki, H. Benford, and A. Atkins

Available from the National Technical Information Service, Springfield, Va. 22161, as COM-73-10930, \$4.75 in paper copy, \$2.25 in microfiche. Report No 139, January 1973. (Marine Administration RD-900-73039) 93 p, 14 fig, 10 tab, 14 ref, append. MA 1-35487

Descriptors: *Winter, *Great Lakes, *Ships, *Transportation, *Cost-benefit analysis, Computer programs, Economic impact, Iced lakes, Inland waterways, Estimating, Design, Optimization, Operations, Benefits.

Identifiers: *Shipowners, *Bulk carriers, Ship designs, Winter navigation, Shipping fleets, Inves-

The capabilities of a computer program developed to project economic benefits to shipowners from extensions of the operating season are presented. The program inputs data concerning trade routes between most ports on the Great Lakes, ship types, ice types, winter severity, and ship charac teristics, with the restrictions that (1) the cargo is iron ore pellets, (2) the ships are U.S. built and operated, with only a moderate degree of automation, and (3) the hulls are largely of mild steel. Outputted by the analysis are: cost of service per ton of cargo, required freight rate, net present value, yield, and capital recovery factor. The computer program is being developed to answer the questions of how best to modify and enhance ships for winter navigation, and how late in the season to continue operations. A description of the com-puter program and summarized results of several parametric studies using the program are included. Optimization on an individual fleet basis, with the assignment of a different length of operating season to each ship on the basis of efficiency, is considered. Also important in estimating total economic benefits is reduced inventory costs. Conclusions as a result of program output made concerning extended season shipping on the Great Lakes. (Becker-Wisconsin) W75-11248

ECONOMIC ANALYSIS OF EFFLUE GUIDELINES: MEAT PACKING INDUSTRY, **ECONOMIC** EFFLUENT Development Planning and Research Associates, Inc., Manhattan, Kans.

For primary bibliographic entry see Field 5G. W75-11249

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES, FERROALLOYS INDUSTRY. Kearney (A. T.) and Co., Inc., Chicago, Ill. For primary bibliographic entry see Field 5G. W75-11250

THE ECONOMIC IMPACT OF POLLUTION ABATEMENT: THE CASE OF WATER POLLUTION BY DEGRADABLE ORGANIC MATTER, Centraal Planbureau, The Hague (Netherlands). For primary bibliographic entry see Field 5G. W75-11254

WILL SUBMERSIBLES MAKE JET PUMPS OB-

For primary bibliographic entry see Field 8C. W75-11263

UNCONVENTIONAL AIR DRILLING REDUCES WELL COSTS.

For primary bibliographic entry see Field 8C. W75-11270

DRILLING RATE AFFECTS COSTS MORE THAN BIT LIFE,

Sandia Labs., Albuquerque, N. Mex. For primary bibliographic entry see Field 8C. W75-11279

HOW DOWNHOLE TEMPERATURES, PRESURES AFFECT DRILLING: PART 8: NEEDLESS SPENDING OF DRILLING AND EXPLORATION MONEY CAN BE PREDICTED-AND PREVENTED.

Engineering Services. For primary bibliographic entry see Field 8G. W75-11298 Continental Oil Co., Houston, Tex. Production

SOME OBSERVATIONS ON RAINFALL IN

WESTERN NEW SOUTH WALES, New South Wales Univ., Kensington (Australia). School of Wool and Pastoral Sciences. For primary bibliographic entry see Field 2B. W75-11304

UPGRADING MEAT PACKING FACILITIES TO REDUCE POLLUTION. (PART 3). CHOOSING THE OPTIMUM FINANCIAL STRATEGY. Commins (J. A.) and Associates, Inc., Fort Washington, Pa

For primary bibliographic entry see Field 5D. W75-11322

POLLUTION ABATEMENT IN A BREWING FACILITY.

Environmental Protection Agency, Washington, D.C. Technology Transfer Staff. For primary bibliographic entry see Field 5D. W75-11323

UPGRADING POULTRY-PROCESSING FACILI-TIES TO REDUCE POLLUTION. (PART 2).
PRETREATMENT OF POULTRY-PROCESSING

Environmental Protection Agency, Washington, D.C. Technology Transfer Staff. For primary bibliographic entry see Field 5D. W75-11329

6D. Water Demand

SOCIAL IMPACTS OF WATER RESOURCES DEVELOPMENTS AND THEIR IMPLICATION FOR URBAN AND RURAL DEVELOPMENT: A POST AUDIT ANALYSIS OF THE WEBER BASIN PROJECT IN UTAH, Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.

For primary bibliographic entry, see Field 6B.

For primary bibliographic entry see Field 6B. W75-10854

THE IMPACT OF THE SAFE DRINKING WATER ACT ON UTILITIES,

Boston Metropolitan District Committee, Mass. For primary bibliographic entry see Field 5G. W75-10859

WATER CONSUMPTION AND WATER TUR-NOVER OF SHEEP GRAZING SEMIARID PASTURE COMMUNITIES IN NEW SOUTH WALES.

Commonwealth Scientific and Industrial Research Organization, Deniliquin (Australia). Riverina

For primary bibliographic entry see Field 3F. W75-10888

For prin W75-10 IMPRO

STREA

THE SU

Geologi

CRITE Oklaho Agricul J. E. Ga Availab tion Se 691, \$4 Comple

Descrip district develop Water industr Identifi tv(Okla Data w Payne

cantly

of cust ranged

to 1198

gallons

usage p

for Cla

Class 1 gallons tap; 60 cow m person Class . mand : per tap tap; 0. 0.6 to gallons to 0.6 The or

WATE LAND WITH of Hor

W75-1

CONS CANA Colora Agrica For pr 6E.

PLIE

For pr

FACT Envir D.C.

WATER RESOURCES PLANNING—Field 6 Water Law and Institutions—Group 6E

STREAMFLOW IN THE NEW YORK PART OF THE SUSQUEHANNA RIVER BASIN, Geological Survey, Albany, N.Y.

For primary bibliographic entry see Field 2E. W75-10931

IMPROVED DESIGN AND OPERATING CRITERIA FOR RURAL WATER DISTRICTS, Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.

I.E. Garton.

Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 691, \$4.75 in paper copy, \$2.25 in microfiche. Completion Report, June 1975. 67 p, 27 fig, 4 tab, 16 ref, 3 append. OWRT B-028-OKLA(2).

Descriptors: *Design criteria, Operations, *Water districts, *Water demand, *Oklahoma, Optimum development plans, Data collections, Water uses, Water utilization, Water supply, Pumping, Dairy industry, Industrial water.

Identifiers: *Rural water district, Payne Countv(Okla).

Data were obtained on Rural Water District No. 3, Payne County, Oklahoma. There was a significantly different pattern of usage for three classes of customers. The average monthly usage per tap ranged from 8768 to 19183 gallons for dairies, 4357 to 11983 gallons for Class A taps, and 2537 to 4160 gallons for Class B taps. The average monthly usage per person ranged from 1424 to 2821 gallons for Class A taps and from 989 to 1664 gallons for Class B taps. Optimal design values for daily demand were in the range of: 350 gallons per tap; 200 gallons per Class B tap; 350 gallons per Class A tap; 600 gallons per Dairy tap; 12 gallons per dairy cow milked; 100 gallons per person; 90 gallons per person, Class B tap; and 150 gallons per person, Class A tap. Optimal design values for peak demand ranged from: 1.0 to 1.5 gallons per minute per tap; 1.3 to 1.8 gallons per minute per Class A tap; 0.6 to 0.9 gallons per minute per Class B tap; 0.6 to 0.8 gallons per minute per person; 0.5 to 0.7 gallons per minute per person, Class A tap; and 0.3 to 0.6 gallons per minute per person, Class B tap. The optimal period off-peak pumping time is from 10 p.m. to 7 a.m., a period of 9 hours. W75-11056

WATER APPLICATION PRACTICES AND LANDSCAPE ATTRIBUTES ASSOCIATED WITH RESIDENTIAL WATER CONSUMPTION, New Mexico State Univ., University Park. Dept. of Horticulture.

For primary bibliographic entry see Field 3D. W75-11059

CONSOLIDATION AND REHABILITATION OF CANALS IN POUDRE VALLEY

Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A. W75-11061

6E. Water Law and Institutions

THE RESPONSIBILITY OF U.S. WATER SUP-PLIERS, Senate, Washington, D.C.

For primary bibliographic entry see Field 5G. W75-10856

FACING THE REAL COST OF CLEAN WATER, Environmental Protection Agency, Washington,

For primary bibliographic entry see Field 5G. W75-10857

THE IMPACT OF THE SAFE DRINKING WATER ACT ON UTILITIES.

Boston Metropolitan District Committee, Mass. For primary bibliographic entry see Field 5G. W75-10859

INTERNATIONAL DEVELOPMENT STRATE-GIES FOR THE SAHEL.

For primary bibliographic entry see Field 4A. W75-10861

HUMAN OBSTACLES TO THE CONTROL OF THE HYDROLOGICAL CYCLE FOR THE

BENEFIT OF MAN, Technion - Israel Inst. of Tech. Haifa (Israel). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W75-10866

IMPACT OF ENERGY DEVELOPMENT ON THE LAW OF THE COLORADO RIVER, California Univ., Los Angeles. School of Law. For primary bibliographic entry see Field 4C. W75-10869

INTERBASIN WATER TRANSFERS: A CASE STUDY IN MEXICO,

Resources for the Future, Inc., Washington, D.C. For primary bibliographic entry see Field 4A.

THE LAW OF WATER ALLOCATION IN KEN-TUCKY.

Kentucky Water Resources Inst., Lexington. R. C. Ausness, and B. H. Flynn. Available from the National Technical Informa-

tion Service, Springfield, Va. 22161 as PB-244 534, \$4.25 in paper copy, \$2.25 in microfiche. Research Report No. 86. July 1975. 81 p. OWRT A-060-KY(1), 14-31-0001-5017.

Descriptors: Legal aspects, Legislation, Water law, Water policy, Water Resources Develop-ment, *Kentucky, *Water allocation(Policy), *Water distribution(Applied), Consumptive use, *Administration, Navigation, Disposal.

This study discusses navigability concepts, consumptive rights to surface and ground waters, the disposal of diffused surface waters and the ad-ministration of Kentucky's statutory water allocation system. Federal regulatory powers are based on navigability as is state ownership of submerged lands. Kentucky uses the ebb-and-flow test of navigability to determine title to submerged lands but uses a navigability-in-fact test to determine the scope of state regulatory authority. Consumptive uses of water in Kentucky are governed by the riparian land-owner to use as much water as he needs as long as his use does not interfere with the legitimate uses of other riparians. Underground streams are subject to the same consumptive use rules, but an overlying landowner can use as much percolating ground water as he needs even though other users are harmed. Kentucky follows the civil law rule with respect to the disposal of diffused surface water, but recent cases seem to have applied the more modern reasonable use rule. In addition to these common-law rules, the Department for Natural Resources and Environmental Protec-tion, under the provisions of KRS Chapter 151, administers a permit system under which both riparian and nonriparian users are allowed to make beneficial uses of water. (Huffsey-Kentucky) W75-10898

INFORMATION AS A REGULATORY TOOL IN WATER QUALITY CONTROL, Wisconsin Univ., Madison. Land Tenure Center; and Wisconsin Univ., Madison. Dept. of Agricul-

tural Journalism. For primary bibliographic entry see Field 5G. W75-10903

WATER POLLUTION PROBLEMS IN SALISBU-RY, RHODESIA: PRESENT AND FUTURE. For primary bibliographic entry see Field 5G.

WATER CONSERVATION IN SWEDEN: III. CURRENT TRENDS,

Ministry of Agriculture, Stockholm (Sweden). For primary bibliographic entry see Field 5G. W75-10987

ROLE AND RESPONSIBILITIES OF THE EN-VIRONMENTAL PROTECTION SERVICE (CANADA),

Environmental Protection Service, Ottawa (Ontario). For primary bibliographic entry see Field 6G. W75-11000

WATER RESOURCES,

British Columbia Water Resources Service, Van-For primary bibliographic entry see Field 5G. W75-11003

MILESTONE WATER LEGISLATION ACCOM-PANIED BY MILLSTONE OF BUREAUCRATIC RED TAPE.

Hampton Roads Sanitary District, Norfolk, Va. For primary bibliographic entry see Field 5G. W75-11007

INDUCED INFILTRATION SUPPLY SYSTEM AMONG BIGGEST.

For primary bibliographic entry see Field 5F. W75-11010

LEGAL AND INSTITUTIONAL PROBLEMS IN THE MANAGEMENT OF SALINITY, Washington Univ., Seattle. School of Lav

For primary bibliographic entry see Field 5G. W75-11047

INSTITUTIONAL ARRANGEMENTS REDUCING CONFLICT OVER WATER QUALITY IN INTERNATIONAL RIVERS,

Arizona Univ., Tucson. Inst. of Government Research.

J. R. Wagner. Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as PB-244 821, \$3.75 in paper copy, \$2.25 in microfiche. Completion Report, August 1975, 48 p. 36 ref, 3 append. OWRT A-057-ARIZ(1), 14-31-0001-4003.

Descriptors: *International Joint Commission, International Bound and Water Comm, *Water policy, *Political aspects, Administrative agencies, Organizations, Legislation, *Institutional constraints, Quality control, International water, *Water quality, United States, Canada, Mexico, Colorado River, Columbia River, Salinity. Identifiers: International rivers, Downstream benefits.

Institutional arrangements coping with the problem of water quality in international rivers were examined. Findings are restricted to the evidence available and are tentative only. Both the International Boundary and Water Commission (United States-Mexico) and the International Joint Commission (United States-Canada) are adequately meeting technical problems of quality control in their respective jurisdictions. Political aspects of water policy, however, caused delays in solving the salinity problem on the Colorado River and the downstream benefits issue on the Columbia River. These problems were beyond the jurisdiction of the IBWC and the IJC and necessitated action at higher, policy-making, levels of government. W75-11242

Field 6-WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

TRANSLATIONS ON ENVIRONMENTAL QUALITY, NO. 33.

Joint Publications Research Service, Arlington,

For primary bibliographic entry see Field 5G. W75-11246

THE WATER INDUSTRY IN TRANSITION, National Water Council, London (England). For primary bibliographic entry see Field 3E.

B(RITISH) C(OLUMBIA) PRESSES FOREST INDUSTRIES CLEAN-UP. For primary bibliographic entry see Field 5G. W75-11350

6F. Nonstructural Alternatives

A CASE STUDY OF SOME ECONOMIC ASPECTS OF THE NATIONAL FLOOD IN-

SURANCE PROGRAM,
Mississippi State Univ., Mississippi State. Div. of
Business Research.

L. R. Cheatham.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 506, \$4.25 in paper copy, \$2.25 in microfiche. Mississippi Water Resources Research Institute, Mississip-pi State, Completion Report, July 1975. 56 p, 6 fig, 16 tab, 14 ref. OWRT A-087-MISS(1).

Descriptors: *Flood Plain Insurance, Economics, *Mississippi, *Investment, *Property values, Government supports, Government finance. Identifiers: Columbus(Miss).

The objective was to determine the impact of federally subsidized flood insurance on urban flood plain development in Columbus, Mississippi The scope of study was limited to determining the effect on business investment and property values. Evidence indicates that the availability of federally subsidized flood insurance has had little effect on the initial location decisions of either business or non-business properties in Columbus, Mississippi. However, mass flood plain en-croachment has occurred since 1968, and there is some evidence that the availability of low-cost insurance may be responsible for businesses and residents remaining on the lands. Data indicate that higher premium rates, which would exist if actuarial rates were charged, would result in a major reduction in the number of policies in force. It appears in the Columbus case that federal disaster aid is more responsible for the current level of commercial investment than subsidized flood insurance. W75-10906

FLOODPLAIN LAND-USE MANAGEMENT: AN APPLICATION OF OPERATIONS RESEARCH

Massachusetts Univ., Amherst. Dept. of Food and

Resource Economics.

J. F. Smiarowski, C. Willis, and J. H. Foster.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 729, \$4.25 in paper copy, \$2.25 in microfiche. Massachusetts Water Resources Research Center, Amherst, Publication No 45, January 1975. Special Report, 44 p, 18 tab, 44 ref, 2 append. OWRT B-028-MASS(5) and B-043-MASS(3). 14-31-0001-

Descriptors: Flood plains, Management, *Decision making, *Flood plain zoning, *Connecticut, *Mathematical models, *Land use, Model studies, Benefits, Costs, Economics, *Operations research.

Identifiers: *Economic analysis, Farming

ton(Conn).

Three models are presented from an investigation of the economic potential of land-use management or zoning for a floodplain in Farmington, Connecticut. The analysis demonstrates the potential use-fulness of operations research methods to flood zone decision-makers, and it provides a set of (conditional) normative decisions which may be of value to the community under investiation. A review was conducted of the literature concerning applications of quantitative methods of problems of floodplain land-use. The mathematical programming methodology is developed, as is the treatment of the empirical results of the application. A general discussion on the distribution (incidence) of benefits and costs of floodplain land-use management among the various sectors of the society is also presented. The use of mathematical programming can aid land-use decisions by identifying economically optimum land-use patterns. The framework of the three models is flexible enough to include aspects of flood proofing and landfill. The material developed will be used along with that developed in similar studies of other flood water management alternatives to other flood water management alternatives to determine an optimum flood management system for the Connecticut River basin. W75-11037

THE ECONOMICS OF FLOOD INSURANCE: AN ANALYSIS OF THE NATIONAL FLOOD IN-SURANCE PROGRAM,

Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.

G. A. Vaut. Available from the National Technical Informa-Avanage from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-244 715, \$4.75 in paper copy, \$2.25 in microfiche. Mas-sachusetts Water Resources Research Center, Amherst, Publication No 46, July 1974, 72 p, 11 tab, 136 ref, Special Report. OWRT B-028-MASS(4) and OWRT B-043-MASS(2).

Descriptors: *Flood plain insurance, Economics, *Risks, *Welfare(Economics), Water policy, Management, Evaluation. Identifiers: *National Flood Insurance Program

The purpose was to provide information relevant to the role of flood insurance as a floodplain management/flood loss reduction measure. first section of the report summarizes the history of the formulation of the current national flood insurance program and its major provisions. second section assesses the implications for flood insurance of two areas of economic theory: individual behavior under uncertainty and welfare economics. The principle of the existence of a certainty equivalent and risk premium has been established in theory. The existence of a residual degree of risk aversion in some individuals has already been demonstrated to support an economically efficient flood insurance arrangement. Some important policy implications are implied by the lexicographic model developed for this study. A change in status for flood insurance, from an endogenous alternative to an exogenous institutional given, must be recognized by flood plain policy makers. W75-11038

PRESCRIPTIVE ECONOMIC MODELS FOR NONSTRUCTURAL FLOOD CONTROL, Cornell Univ., Ithaca, N.Y.

W. F. Bialas

Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244
720, \$7.00 in paper copy, \$2.25 in microfiche.
Technical Report No 97, Cornell University Water Resources and Marine Sciences Center, thaca, New York June 1975. 184 p, 21 fig, 2 tab, 68 ref, 4 append. OWRT C-5240(No 4230)(2).

Descriptors: *Flood plains, *Flood plain zoning, *Land use, *Non-structural alternatives, *Linear programming, Alternative planning, Optimization, Economic efficiency, Probability, Equations, Mathematical models, System analysis. A linear programming model is developed to select optimal floodplain management plans which will reduce damage due to inundation and be economically and environmentally sound. The technique is intended for relatively inexpensive screening of floodplain management alternatives before carrying out a plan-by-plan search with more detailed and expensive methods of analysis. Viewing the floodplain as a land use allocation problem in three dimensions, this formulation permits a direct as-sessment of expected flood damage on the basis of location and elevation. The model discretizes time, flood losses, topography, and building heights. Decision variables include changes in the land use allocation in the floodplain; shifts in the activity schema of developed basins can be handled. Also. the effects of the floodwater displaced by various activities can be explicitly measured and included as a component of flood risk. Techniques to account for environmental impact when floor does not occur are also incorportated. The ambient concentrations of residuals at each site are calculated as a function of the degree and type of land use activity of all sites. The model defines the amount of generated residual to be treated at each location to maintain the desired environmental quality standards. The standards are themselves functions of the land use allocation plan, with each plan evaluated on the basis of capital costs required for land use reallocation, change in land rent, and change in residuals treatment costs, if any. (Bell-Cornell) W75-11060

Car for Car

the

pro

ble

bal

sys

cid

cor

OI

FR

En

De *B

tro

Te

COI

to

tio tial hu

con

ass and

and

die

org

ece Bio

bui

wit

Bio

Fo bei

6G. Ecologic Impact Of Water Development

MAN'S INFLUENCE ON THE HYDROLOGI-CAL CYCLE: A DRAFT REPORT OF THE UNESCO/FAO WORKING GROUP ON THE IN-TERNATIONAL HYDROLOGICAL DECADE. Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Develop-For primary bibliographic entry see Field 2A. W75-10863

BALANCING THE EFFECTS OF MAN'S AC-TIONS ON THE HYDROLOGICAL CYCLE, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry. For primary bibliographic entry see Field 2A. W75-10865

AN ANALYSIS OF THE MOTOR-ROW CON-VERSION ISSUE OF COLORADO RIVER FLOAT TRIPS,

Arizona Univ., Tucson. Dept. of Watershed Management.

For primary bibliographic entry see Field 6B. W75-10867

ROLE AND RESPONSIBILITIES OF THE EN-VIRONMENTAL PROTECTION SERVICE (CANADA),

Environmental Protection Service, (Ontario).

.. Edgeworth. In: Proceedings of the Annual Conference of British Columbia Water and Waste Association, April 9-11, 1974, Vancouver, British Columbia, p 59-69.

Descriptors: *Water position control, *Legislation, *Canada, Environmental control, Descriptors: Administration.

The history and duties of the Environmental Protection Service of Canada are discussed. The EPS is concerned not only with activities that are directly tied to environmental protection but also with the management and improvement of

Canada's renewable resources such as fisheries, forestry and wildlife. The Fisheries Act, the Canada Water Act, and the Fisheries Act amendments are some of the legislation that has defined the roles of the federal and local governments and provides for an optimization of benefits through rational resource management. Water pollution control is based on the use of the best practicable technology, meaning that in most cases it does the job in terms of protecting the environment, and also meaning that it does not require the impossible or the economically destructive. The goal of a balanced program is being achieved through a system of cooperation. The EPS has set up a special Environmental Emergency Branch to improve the national ability to deal with environmental accidents such as oil spills. This unit is developing contingency plans for all conceivable problems and is developing a central operations center. Newer legislation is directed toward the control of special types of products which may cause pollu-tion problems such as gasoline additives and phosphate containing detergents. Canada is learning that energy and the environment are not two different disciplines but that the preservation of a clean environment is the result of the knowledgable application of energy through the right sources. W75-11000

OIL SPILL TECHNOLOGY.

Environmental Protection Service, Ottawa (Ontario). Environmental Emergency Branch. For primary bibliographic entry see Field 5G. W75-11001

FRESHWATER ECOSYSTEM RESEARCH IN WATER QUALITY MANAGEMENT, Rensselaer Polytechnic Inst., Troy, N.Y. Fresh

J. Ferris, N. L. Clesceri, and S. I. Auerbach. Environmental Science and Technology, Vol 8, No 8, p 706-710, August, 1974. 3 fig, 2 tab, 5 ref.

Descriptors: *Water quality, Management, *Biomes, Freshwater, *Ecosystems, Lakes, Reservoirs, Forests, Deserts, Environmental control, Fish, Aquatic life, *United States.

Teams of U.S. scientists from many disciplines combined to study total ecosystems in the U.S. The International Biological Program was created to help define the biological basis of productivity for human welfare, investigation organic production on land, in fresh waters, and in seas, potentialities and uses of new natural resources, and human adaptability to a changing environment. A common goal was the achievement of information that would lead to rational resource management for fresh water ecosystems. The ability of proper assessment was founded on a simplified method, and the predictability of changes in the conditions and dynamics of ecosystems was demonstrated by ecosystem modeling. More than 80 lakes were studied. The U.S. was integrated into biomes of living organisms, with each community exhibiting its own scientific similarity. The Tundra Biome con-centrated on natural and exogenously disturbed ecosystems in the wet Arctic tundra. The Desert Biome investigated abiotic and biotic systems and built question-oriented submodels describing a series of relationships allied to organism function within the ecosystem. The Coniferous Forest Biome assessed forest and urban land-use influences, energy sources for aquatic food chains, and the structure and metabolism of communities and their nutrient budgets. The Eastern Deciduous Forest Biome concentrated on the IBP goal of better ecosystem understanding and the prediction of results from changes induced by man. (Leibowitz-FIRL) W75-11012

GUIDELINES FOR REVEGETATION AND STA-BILIZATION OF SURFACE MINED AREAS IN THE WESTERN STATES, Colorado State Univ., Fort Collins. Dept. of Range

For primary bibliographic entry see Field 4D. W75-11100

STRATEGIC APPROACH TO ESTUARINE EN-VIRONMENTAL MANAGEMENT,
Oregon State Univ., Corvallis. Dept. of Civil En-

gineering.
For primary bibliographic entry see Field 2L. W75-11179

MAN'S IMPACT ON A NEWLY FORMED RESERVOIR

New Mexico Univ., Albuquerque. Dept. of Biology. For primary bibliographic entry see Field 5C.

NON-RENEWABLE. NON-ENERGY

RESOURCES, Leicester Univ (England). Public Sector Economics Research Centre. For primary bibliographic entry see Field 6B. W75-11253

GUIDELINES FOR THE IDENTIFICATION OF POTENTIAL ENVIRONMENTAL IMPACTS IN THE CONSTRUCTION AND OPERATION OF A RESERVOIR, Illinois Univ., Urbana. Dept. of Forestry

For primary bibliographic entry see Field 5C. W75-11316

7. RESOURCES DATA

7A. Network Design

W75-11233

INVESTIGATION OF THE OPERATING CHARACTERISTICS OF THE IOWA SEDI-SYSTEM,

Iowa Univ., Iowa City. Inst. of Hydraulic Research. For primary bibliographic entry see Field 2J.

THE MEASUREMENT AND ESTIMATION OF LAKE EVAPORATION FROM FOUR AUSTRALIAN WATER STORAGES,

Bureau of Meteorology, Melbourne (Australia). For primary bibliographic entry see Field 2D.

DIFFICULTIES IN GAUGING SMALL CATCHMENTS - A CASE STUDY, New South Wales Univ., Kensington (Australia).

School of Civil Engineering. For primary bibliographic entry see Field 2E. W75-11306

AUSTRALIAN ARID ZONE STREANGAUGING, New South Wales Dept. of Public Works, Sydney (Australia). Water Supply and Sewerage Branch. For primary bibliographic entry see Field 2E.

ASPECTS OF RAINFALL MEASUREMENT IN

A NEW ENGLAND LOCATION, University of New England, Armidale (Australia). Dept. of Geography.
For primary bibliographic entry see Field 2B.
W75-11309

7B. Data Acquisition

MEASUREMENT OF COBBLE ABRASION IN NATURAL STREAMS,

Arizona Univ., Tucson. Dept. of Hydrology and Water Resources For primary bibliographic entry see Field 2J. W75-10881

A SIMPLE AND INEXPENSIVE TECHNIQUE FOR DETERMINING COLORED LIGHT IN-TENSITY UNDERWATER,

Genesee Community Coll., Batavia, N.Y. Mathematics and Science Div. B. A. Marcus.

Water Resources Research, Vol 11, No 3, p 491-492. June 1975. 4 fig, 5 ref.

Descriptors: *Ligh intensity, *Optical properties, Light, *Instrumentation, *Light penetration, Light, *Instrumentation, *Light penetration,
*New York, Color, Opacity, Photometry, Penetration, Turbidity, Secchi disks, Filters, Analytical techniques, Evaluation, Water, Underwater.

A technique for underwater determination of colored light intensity, relative to the surface, was presented. The technique involves using gelatin filters which are less expensive and more easily cut to fit meters than glass. (Henley-ISWS)

DETERMINATION OF REGIONAL HYDRAU-LIC CONDUCTIVITY THROUGH USE OF C-14 DATING OF GROUNDWATER,

Geological Survey, Reston, Va. For primary bibliographic entry see Field 2F.

EVAPOTRANSPIRATION OF FOUR FOREST TYPES MEASURED WITH THE EDDY COR-RELATION TECHNIQUE,

Washington Univ., Seattle. Coll. of Forest Resources. For primary bibliographic entry see Field 2D.

W75-11044

DEVICE FOR AUTOMATIC DETERMINATION OF SUSPENDED SOLIDS CONTENT IN WATER,

Agency of Industrial Science and Technology, Tokyo (Japan). (assignee) For primary bibliographic entry see Field 5A. W75-11063

MEASURES OF BIODEGRADABILITY AND REFRACTORY ORGANICS IN WASTE-WATERS: (ANALYSIS, INTERPRETATION, AND APPLICATION OF MEASUREMENT TECHNIQUES),

Connecticut Univ., Storrs. For primary bibliographic entry see Field 5D.

NOTE ON THE MEASUREMENT OF THE RESPONSE OF OCEANOGRAPHIC TEMPERA-

TURE SENSORS, National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.

Journal of Geophysical Research, Vol 80, No 18, p 2663-2666, June 20, 1975. 4 fig, 2 tab, 3 ref.

Descriptors: *Temperature, *Thermometers, *Water temperature, *Instrumentation, *Thermal properties, Physical properties, Measurement, Calibrations, Properties, Water properties, Esti-mating, Evaluation, Testing, Oceanography, Testing procedures, Mathematical studies, Oceans, Numerical analysis, Salinity, Analytical techniques.

Field 7—RESOURCES DATA

Group 7B—Data Acquisition

Identifiers: *Oceanographic temperature sensors, *Response time, Platinum resistance sensors, Rotating water container method, Photodiode detector system, Wheatstone bridge.

The response time of three different types of oceanographic platinum resistance temperature sensors was measured employing the conventional rotating water container procedure. At low sensor immersion velocieis (less than 100 cm/s) the response was strongly dependent upon the details of the sensor insertion velocity for one sensor design. With carefully defined measurement procedures, reproducible values for the 'time constant' were obtained, but their application in data analysis must be treated with caution. (Henley-W75-11146

INVESTIGATION OF THE OPERATING CHARACTERISTICS OF THE IOWA SEDIMENT CONCENTRATION MEASURING SYSTEM,

Iowa Univ., Iowa City. Inst. of Hydraulic Research.

For primary bibliographic entry see Field 2J. W75-11163

CHARGED DROPLET COLLISION EFFICIEN-CY MEASUREMENTS,

National Center for Atmospheric Research. Boulder, Colo.

For primary bibliographic entry see Field 2B. W75-11168

AQUATIC WEED FIELD TEST PROGRAM USING A CO2 ELECTRIC DISCHARGE CON-

VECTION LASER, Army Engineer Waterways Experiment Station, Vicksburg, Miss.

For primary bibliographic entry see Field 5A. W75-11208

APPLICATION OF THE MANOMETRIC TECHNIQUE IN THE STUDY OF SEDIMENT OXYGEN DEPLETION.

Canada Centre for Inland Waters, Burlington (Ontario).

For primary bibliographic entry see Field 5C. W75-11222

EXTRACTION AND ANALYTICAL TECHNIQUES FOR PESTICIDES IN SOIL, SEDIMENT, AND WATER,

Wisconsin Univ., Madison. Water Resources Center. For primary bibliographic entry see Field 5A. W75-11236

THE UTILIZATION OF SUN-GLINT IN A

STUDY OF LAKE DYNAMICS, Canada Centre for Inland Waters, Burlington(Ontario). For primary bibliographic entry see Field 5A. W75-11239

A PNEUMATIC SYSTEM TO PUMP WATER FROM PIEZOMETERS.

Department of the Environment, Lethbridge (Alberta). Research Station. For primary bibliographic entry see Field 8C. W75-11257

APPARATUS FOR CONCENTRATION OF VOLATILE ORGANIC POLLUTANTS IN

Tekmar Co., Cincinnati, Ohio. For primary bibliographic entry see Field 5A. W75-11342

7C. Evaluation, Processing and Publication

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOL. II, ASPECTS OF COMPUTATION, RAND Corp., Santa Monica, Calif. For primary bibliographic entry see Field 2L.

TWO-DIMENSIONAL, HYDROSTATIC SIMU-LATION OF THERMALLY-INFLUENCED HYDRODYNAMIC FLOWS.

Stanford Univ., Calif. Dept. of Civil Engineering. For primary bibliographic entry see Field 2H. W75-10901

A COMPUTER PROGRAM PACKAGE FOR AQUATIC ECOLOGISTS,

Cornell Univ., Ithaca, N.Y. For primary bibliographic entry see Field 2H. W75-10908

COMPUTER ALGORITHMS USEFUL FOR DETERMINING A SUBSURFACE ELECTRICAL PROFILE VIA HIGH FREQUENCY PROBING, California Univ., Livermore. Lawrence Liver-

more Lab. For primary bibliographic entry see Field 8G. W75-10910

AUTOMATED DISTRIBUTION OF GAUGE AND SHIFT CORRECTIONS,
Department of the Environment,

Ottawa (Ontario). Water Resources Branch. January 1975. 29 p, 6 fig.

Descriptors: *Data processing, *Computer programs, *Stage-discharge relations, *Data storage and retrieval, Water levels, Discharge(Water), Computers, Automation, Distribution, Information retrieval, Gages. Identifiers: Gage corrections, Shift corrections.

A set of detailed instructions was provided to explain the use of the GCSC computer program. This program will produce: (1) printouts of an expanded stage-discharge table with figures rounded to the standard rule for significant figures, along with an option to plot the curve; (2) annual page of daily mean gage corrections; and (3) annual page of daily mean shift corrections. These printouts may be used to assist in the quality checking of data from the STREAM and MANUAL computer programs or in the manual computation of discharge or water level data. (Scott-ISWS) W75-10911

AUTOMATED TIDAL COMPUTATIONS, Ottawa Department of the Environment, (Ontario). Water Resources Branch. K. W. Stewart. January 1975. 53 p, 16 fig.

Descriptors: *Computer programs, *Data processing, *Tides, Computers, Data storage and retrieval, Gages, Automation, Water levels, Information retrieval Identifiers: Hourly.

A set of detailed instructions was provided to automate tidal computations by using a digitizer in-terfaced with a card punch. Detailed instructions were provided for digitizing water level recorder charts to obtain punched cards containing the X-Y coordinates. With these cards and the card deck defining the gage corrections, the computer program TIDAL (WSC No. J21035) is used to obtain instantaneous hourly water levels on printouts or punched cards. The TIDAL program computes instantaneous gage heights at hourly intervals. The only output options available in the TIDAL program are listings of hourly and mean gage heights and punched cards in TWL 501 format. Only rectilinear graphical charts can be processed by the TIDAL program. (Scott-ISWS) W75-10912

FLOW FILE OPERATIONS MANUAL, Department of the Environment, (Ontario). Water Resources Branch. Ottawa K. W. Stewart. January 1975. 74 p, 1 fig.

Descriptors: *Computer programs, *Data storage and retrieval, *Data processing, *Canada, Computers, Data collections, Hydrographs, Information retrieval, Streamflow, Monthly, Average, Annual. Discharge(Water) Identifiers: Daily

A detailed description was given of the FLOW magnetic tape file of historical daily discharges as well as detailed instructions and an explanation of the computer programs for the storage and retrieval of these data on the CDC CYBER 74 computer at the Department of Energy, Mines and Resources (EMR), Ottawa (Canada). The FLOW file now contains some 37,000 station-years of daily discharges to December 1973 on 15 reels of tape (some 133 million characters of data are stored at 800 bpi). Data are stored by District and by station number order within each District. To facilitate the retrieval and publication of monthly and annual mean discharges and total acre-feet, a TOTALS file is created from the FLOW file and contains the monthly totals in cfs-days for all stations on one reel of tape. Historical daily, monthly, and annual streamflow data can be supplied to users on punched cards or magnetic tape for computer processing. Instructions for plotting annual daily discharge hydrographs using the CYBER 74 computer and CALCOMP plotter at EMR were given. (Scott-ISWS) W75-10913

DESCRIPTION OF CARD AND TAPE FOR-MATS FOR SUPPLYING DATA TO USERS.
Department of the Environment, Of (Ontario). Water Resources Branch.

1975.15 n.

Descriptors: *Canada, *Hydrologic data, *Date storage and retrieval, *Data processing, Stream-*Discharge(Water), Sediments, Annual, Average, Suspended solids, Information retrieval, Hydrometry, Annual peak discharge. Identifiers: Daily.

A description was given of the various card and tape formats in which hydrometric data for Canada can be supplied to users. Streamflow and sediment data can be supplied in card format either on punched cards or magnetic tape. Daily discharge data can also be supplied in main file format on magnetic tape. As of 1975, the only data that can be supplied are daily discharges, monthly and annual mean discharges, and annual maximum instantaneous discharges in cfs for the period of record to December 1973 inclusive; and daily suspended sediment concentration in mg/l for the period of record to December 1970 inclusive. Period of record summary listings, indicating the months and/or years for which data are available, can also be supplied. The procedure by which users can request data for stations in each of the districts of Canada was indicated. This description is an updated version of the 1973 edition. As other types of hydrometric data become available on punched cards or magnetic tape for distribution to users, other updated editions will be published. (Scott-ISWS)

AUTOMATED HOURLY COMPUTATIONS, Department of the Environment, Ot (Ontario). Water Resources Branch. (Ontario). Wate K. W. Stewart. January 1975. 68 p, 16 fig.

Descriptors: *Computer programs, *Data processing, *Streamflow, *Water levels, State-discharge relations, Gages, Discharge(Water), Data storage and retrieval, Information retrieval, Automation, Computers. Identifiers: *Hourly.

ge

r),

W

W

of

of

ате

hly

, a nd

ly, ıp-

ipe

ind

ind

nat

ily

file

ata hly um

aily the

ve.

ole,

on

A set of detailed instructions was given to automate streamflow and water level computations at selected time intervals by using a digitizer interfaced with a card punch. Detailed instructions for digitizing water level recorder charts were provided to obtain punched cards containing the X-Y coordinates. With these cards and the card decks defining the stage-discharge relationships and gage and shift corrections, the computer program HOURLY (WSC No. J21019) is used to obtain instantaneous gage heights and/or discharges. The following options are available in this program: (1) a listing of the expanded stage-discharge table; (2) a listing of the expanded stage-discharge table; (2) a listing of the instantaneous discharges or instantaneous gage heights, or both, on a selected time interval of 15 minutes or 1, 2, 3, 4, 6, or 8 hours, and for a selected number of days; (3) card output of the instantaneous discharges instantaneous discharges. of the instantaneous discharges or instantaneous water levels, or both; (4) processing of linear, 'curved-line,' or 'arc-line' charts (both the 'curved-line' and the 'arc-line' charts have a curved gage height axis but the 'curved-line' charts have a nonlinear vertical scale and the 'arc-line' ch charts have a linear vertical scale.); (5) plotted output of the chart record as digitized; and (6) plotted output of the computed instantaneous discharges and/or water levels. (Scott-ISWS) W75-10915

QUALITY OF WATER IN AQUIFERS OF THE AMARGOSA DESERT AND VICINITY, NEVADA,

Geological Survey, Denver, Colo. For primary bibliographic entry see Field 5B. W75-10932

TEMPERATURES OF KANSAS STREAMS, Geological Survey, Lawrence, Kans. For primary bibliographic entry see Field 2E.

THE MINOR AND TRACE ELEMENTS, GAS, AND ISOTOPE COMPOSITIONS OF THE PRINCIPAL HOT SPRINGS OF NEVADA AND

Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 2K. W75-10937

ESTIMATED AVAILABILITY OF SURFACE AND GROUND WATER IN THE POJOAQUE RIVER DRAINAGE BASIN, SANTA FE COUN-

TY, NEW MEXICO, Geological Survey, Albuquerque, N. Mex. For primary bibliographic entry see Field 4A. W75-10938

LOW-FLOW CHARACTERISTICS OF SELECTED STREAMS IN NORTHEASTERN WASHINGTON,

Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 2E. W75-10939

GROUND WATER IN THE CORVALLIS-AL-BANY AREA, CENTRAL WILLAMETTE VAL-LEY, OREGON,

Geological Survey, Reston, Va. For primary bibliographic entry see Field 2F. W75-10940

ESTIMATED MEAN-MONTHLY AND ANNUAL RUNOFF AT SELECTED SITES IN THE POJOAQUE RIVER DRAINAGE BASIN, SANTA FE COUNTY, NEW MEXICO, Cardinial Survey Albumparque, N. Mey

Geological Survey, Albuquerque, N. Mex. For primary bibliographic entry see Field 2E. W75-10943

RECHARGE AREAS OF THE FLORIDAN AQUIFER IN SEMINOLE COUNTY AND VICINITY, FLORIDA, Geological Survey, Tallahassee, Fla.

. H. Tibbals.

Florida Bureau of Geology, Tallahassee, Map Series No. 68, 1975. 1 sheet, 3 fig, 6 ref.

Descriptors: *Groundwater recharge, *Groundwater resources, *Aquifer characteristics, *Florida, Hydrologic data, Maps, Water wells, Withdrawal, Water supply, Rainfall, Hydrology, Hydrogeology, Hydrologic budget. Identifiers: *Seminole County(Fla), *Floridan aquifer, Penharge area aquifer, Recharge areas.

The Floridan aquifer is the most important source of water supply in Seminole County, Florida. Virtually all public and domestic water supplies and most of the water used for irrigation are from wells that tap the Floridan. Hence, delineating the areas that recharge the aquifer is important. This map re-port shows those areas where the Floridan aquifer is subject to recharge or discharge. Recharge to the Floridan aquifer can occur wherever the water table (or a lake surface) is above the potentiometric surface of the Floridan. However, the rate of recharge is governed by: (1) the thickness and permeability of the intervening confining beds and (2) the degree of hydraulic potential, or head dif-Floridan aquifer. (Woodard-USGS) W75-10944

WATER RESOURCES OF THE LOWER ST. CROIX RIVER WATERSHED, EAST-CENTRAL MINNESOTA.

Geological Survey, Reston, Va. G. F. Lindholm, J. O. Helgesen, W. L. Broussard, and D. F. Farrell.

For sale by USGS, Reston, Va 22092, \$2.25 per set. Hydrologic Investigations Atlas HA-490, 1974. 3 sheets, 22 ref.

Descriptors: "Water resources, "Watershed management, "Minnesota, "Hydrologic data, Maps, Hydrographs, Climatic data, Hydrologic budget, Water utilization, Surface waters, Groundwater resources, Water resources development, Watershed management, Aquifer charac-teristics, Streamflow, Water yield, Water quality, Geology, Bedrock, Glacial drift. Identifiers: *Lower St. Croix River(Minn).

This 3-sheet atlas describes water resources of the lower St. Croix River watershed, east-central Minnesota. Average annual precipitation in the watershed is about 28 inches. Of that amount, about 22 inches is removed by evaporation and transpiration. The average annual runoff is about 6 transpiration. The average annual runoff is about 6 inches. Virtually all large water users in the watershed obtain water supplies from bedrock aquifers. Withdrawals in 1967 exceeded 1.2 billion gallons. Groundwater is generally very hard, greater than 180 mg/liter. Water from any of the formations may be high in iron, exceeding the recommended limits of 0.3 mg/liter for drinking water. The lower St. Croix River, its tributaries, and many lakes, provide an abundance of water of cool quality which is suitable for most industrial. a rod quality which is suitable for most industrial, municipal, and agricultural uses. Flooding is not a major problem in the basin. Most flood damage is confined to the vicinity of Lake St. Croix. Streamflow is sustained during dry periods by the large amount of natural storage, both on the surface and in the ground. (Woodard-USGS) W75-10945 WATER RESOURCES OF THE SNAKE RIVER WATERSHED, EAST-CENTRAL MINNESOTA,

Geological Survey, Reston, Va. G. F. Lindholm, J. O. Helgesen, W. L. Broussard, and D. W. Ericson.

For sale by USGS, Reston, Va 22092, \$2.00 per set. Hydrologic Investigations Atlas HA-488, 1974. 3 sheets, 20 ref.

Descriptors: *Water resources, *Watershed management, *Minnesota, *Hydrologic data, Maps, Hydrographs, Groundwater resources, Aquifer characteristics, Hydrology, Water utilization, Water yield, Water quality, Groundwater recharge, Surface waters, Streamflow, Geology, Glacial drift, Bedrock, Evapotranspiration, Soil moisture, Flood frequency, moisture, Flood frequency. Identifiers: *Snake River watershed(Minn).

This 3-sheet atlas describes water resources of the Snake River watershed in east-central Minnesota. All domestic, municipal, and industrial water supplies in the watershed are obtained from ground-water sources. Water use is greatest at Mora where withdrawals doubled from 1964 to 1969. Precipitation, the primary source of recharge to the watershed, averaged about 28.9 inches per year during 1939-68. Evapotranspiration, the main discharge process, is generally greatest in July and August, commonly resulting in moisture deficits for optimum plant growth. The average annual run off from the Snake River basin is about 8.5 inches. Groundwater is generally very hard (greater than 180 mg/liter) and of the calcium mag-nesium bicarbonate type. The larger base-flow yields in the basin are from streams draining outwash areas. During base-flow periods, a substantial amount of the flow in the Snake River is from groundwater discharging directly to the main channel. Seventy-five percent of the annual minimum flows in the lower reaches of the Snake River occur late in the winter. (Woodard-USGS)

WATER RESOURCES OF THE LOWER MIN-NESOTA RIVER WATERSHED, SOUTH-CENTRAL MINNESOTA,

Geological Survey, Reston, Va. H. W. Anderson, Jr., D. F. Farrell, and W. L. Broussard.

For sale by USGS, Denver, Colo 80225, and Reston, Va 22092, \$2.25 per set. Hydrologic Investigations Atlas HA-526, 1974. 3 sheets, 9 ref.

Descriptors: *Water resources, *Watershed management, *Minnesota, *Hydrologic data, management, "Minnesota, "Hydrologic data, Maps, Hydrographs, Groundwater resources, Streamflow, Runoff, Water quality, Hydrology, Hydrologic budget, Water utilization, Aquifecharacteristics, Water yield, Groundwater recharge, Glacial drift, Evaluation, Geology, Lidwiffers, Louise, Minnesota, Pinger(Miss.) Identifiers: *Lower Minnesota River(Minn)

This 3-sheet atlas describes the water resources in the Lower Minnesota River watershed in south-central Minnesota. The main sources of water are precipitation and flow in the Minnesota River, which enters the watershed from the south. All municipalities use groundwater supplies. Glacial sand and gravel are widely used aquifers in the west. The Dresbach, Jordan, and St. Peter aquifers are the most reliable and widely used in the central and eastern parts. The use of groundwater is about 12,000 million gallons per year. This estimate represents 0.34 inch of water used compared with 28.8 inches of precipitation, 24.3 inches of evapotranspiration, and 4.5 inches of runoff. Considerably more water could be used without seri-ously depleting the amount of groundwater in storage or affecting the water budget. Dissolved solids, sulfate, and bicarbonate concentrations in water from glacial deposits decrease generally from west to east. Dissolved solids range from 900 mg/liter from areas of gray till to generally less than 400 mg/liter from areas of red till and from outwash deposits. Runoff is greatest in the spring and early summer, after the spring breakup. Ru-

Field 7—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

noff may be high locally in the summer after intense storms. (Woodard-USGS)

WATER RESOURCES OF THE CANNON RIVER WATERSHED, SOUTHEASTERN MIN-

NESOTA, Geological Survey, Reston, Va. H. W. Anderson, Jr., D. F. Farrell, W. L. Broussard, and P. E. Felsheim.

For sale by USGS, Denver, Colo 80225 and Reston, Va 22092, \$2.25 per set. Hydrologic In-vestigations Atlas HA-522, 1974. 3 sheets, 6 ref.

Descriptors: *Water resources, *Watershed management, *Minnesota, *Hydrologic data, management, "Minnesota, "Hydrologic data, Maps, Hydrographs, Surface waters, Streamflow, Runoff, Sediment transport, Water quality, Groundwater resources, Aquifer characteristics, Hydrology, Geology, Water yield, Water utilization, Hydrologic budget, Water supply. Identifiers: "Cannon River watershed(Minn).

This 3-sheet atlas describes the water resources of the Cannon River watershed in southeastern Minnesota. The 1,462 square miles of land surface in the watershed varies considerably from areas of low hills and plains to areas dominated by streams deeply incised into bedrock. Water entering the watershed as precipitation is approximately equal to surface runoff plus evapotranspiration. No significant areas of groundwater decline are known, indicating that the volume of water in storage is fairly constant. Water use in 1970 for public supply, rural supply, and self supplied (industrial and thermoelectric power), was 6,423 million gallons of groundwater and 26,216 million gallons of surface water. The population that year was 84,000. (Woodard-USGS) W75-10948

THE HYDROLOGIC CYCLE--AS APPLICABLE TO THE PACIFIC NORTHWEST, Geological Survey, Tacoma, Wash.

D Molenaar

Available from Washington State Dept. of Ecology, Tacoma, Wash, \$1.00 in paper copy. Washington State Department of Ecology, Olympia, Geohydrologic Monograph 4, 1975. 1 map.

Descriptors: *Maps, *Hydrologic cycle, *Pacific Descriptors: Maps, "rygrotogic cycle, "Facilic Northwest US, Climatic zones, Precipita-tion(Atmospheric), Runoff, Surface waters, Groundwater, Hydrology, Evaporation, Evaportanspiration, Transpiration.

This map of the hydrologic cycle representative of conditions in the Pacific Northwest, shows the pattern of water movement as it circulates through the natural system--as precipitation from the atmosphere to the earth, as surface runoff and streamflow to the sea, as percolation into the ground and seepage back to the surface, and as evaporation and transpiration back to the atmosphere. Precipitation as rain and snow is the source of all freshwater. A part of the precipitation runs off rapidly to streams, and a part is evaporated directly back to the atmosphere from the ground and from lakes, streams, and plant surfaces. A part soaks into the soil where some is drawn up by plants and returns to the atmosphere by evapotranspiration through and from the leaves; the remainder percolates downward to a zone of saturation to become groundwater. In turn, most of the groundwater returns to the surface-water system by seepage to springs, lakes, streams, and the sea. The Pacific Northwest is a land of climatic and topographic contrasts that are reflected as extremes in natural hydrologic conditions. Average annual precipitation varies widely, from more than 200 inches at places in the higher mountains to less than 8 inches in the semiarid region east of the Cascade Range. (Woodard-USGS) W75-10949

CONTOUR MAP OF THE BEDROCK SUR-FACE, NEW BRITAIN QUADRANGLE, CON-

NECTICUT, Geological Survey, Hartford, Conn.

E. H. Handman.

Miscellaneous Field Studies Map MF-523 C (Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 135), 1975. I sheet, I map, 4 ref.

*Soils Descriptors: surveys. *Connecticut, Descriptors: "Sous surveys, "connecticut, "Geologic mapping, "Bedrock, Contours, Geologic investigations, Mapping, Overburden, Soils, Sediments, Rocks. Identifiers: "Bedrock surface maps,

*Britain(Conn), Urban geology.

Contours show the altitude of the bedrock surface in the New Britain quadrangle, Connecticut. The position of the contours is based largely on data from wells, test holes, and published geologic maps supplemented by knowledge of the geologic history of the region. The map shows the configuration of the bedrock surface if all unconsolidated earth materials were removed. (Woodard-USGS) W75-10950

MAP SHOWING DEPTH TO BEDROCK, WORTHINGTON QUADRANGLE. SACHUSETTS,

Geological Survey, Boston, Mass. C. J. Londquist.

Miscellaneous Field Studies Map MF-662 A (Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 136), 1975. 1 sheet, 1 map, 2 ref.

Descriptors: *Soils surveys. *Massachusetts. *Geologic mapping, *Bedrock, Geologic investiga-tions, Overburden, Soils, Sediments, Rocks. *Depth *Worthington(Mass), Urban geology.

This map indicates depth to bedrock below land surface in the Worthington quadrangle, Massachusetts. The locations of bedrock outcrops were obtained by field mapping and from a surficial geology map. Depths to bedrock are inferred from logs of wells and test holes and excavations for utility lines and foundations supplemented by data from a contour map of the bedrock surface. Depths shown are a generalization of localized highly variable conditions and do not include any weathered (decomposed) bedrock. (Woodard-W75-10951

MAP SHOWING DEPTH TO BEDROCK, GREENFIELD QUADRANGLE, SACHUSETTS.

Geological Survey, Boston, Mass.

C. J. Londquist.
Miscellaneous Field Studies Map MF-629 B (Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 140), 1975, 1 sheet, 1 map, 10 ref.

*Soil surveys, *Massachusetts, Descriptors: *Geologic mapping, *Bedrock, Geologic investiga-tions, Overburden, Soils, Sediments, Rocks. Identifiers: *Depth to bedrock, *Greenfield(Mass), Urban geology.

This map indicates depth to bedrock below land surface in the Greenfield quadrangle, Massachusetts. The locations of bedrock outcrops were obtained by field mapping and from a surfi-cial geology map. Depths to bedrock are inferred from logs of wells and test holes and excavations for utility lines and foundations supplemented by data from a contour map of the bedrock surface. Depths shown are a generalization of localized highly variable conditions and do not include any weathered (decomposed) bedrock. (Woodard-USGS)

MAP SHOWING DEPTH TO BEDROCK, CHESTER QUADRANGLE, MASSACHUSETTS. Geological Survey, Boston, Mass.

Geological Survey, Boston, mass. C. J. Londquist.
Miscellaneous Field Studies Map MF-667 A
(Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 141), 1975. 1 sheet, 1 map, 2 ref.

Descriptors: *Soil surveys, *Massachusetts, *Geologic mapping, *Bedrock, Geologic investiga-tions, Overburden, Soils, Sediments, Rocks. Identifiers: *Depth to bedrock, *Chester(Mass), Urban geology.

This map indicates depth to bedrock below land surface in the Chester quadangle, Massachusetts. The locations of bedrock outcrops were obtained by field mapping and from a surficial geology map. Depths to bedrock are inferred from logs of wells and test holes and excavations for utility lines and foundations supplemented by data from a contour map of the bedrock surface. Depths shown are a generalization of localized highly variable condi-tions and to not include any weathered (decomposed) bedrock. (Woodard-USGS) W75-10953

MAP SHOWING DEPTH TO BEDROCK, MOUNT CARMEL QUANDRANGLE, CONNEC-TICUT,

Geological Survey, Hartford, Conn. E. H. Handman, and M. H. Ginsberg.

Miscellaneous Field Studies Map MF-540 B (Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 142), 1975. 1 sheet, 1 map, 5 ref.

Descriptors: "Soils surveys, "Connecticut, "Geologic mapping, "Bedrock, Geologic investigations, Overburden, Soils, Sediments, Rocks. Identifiers: "Depth to bedrock, "Mount Carmel(Conn), Urban geology.

This map indicates depth to bedrock below land surface in the Mount Carmel quadrangle, Connec-ticut. The locations of bedrock outcrops were obtained by field mapping and from a surficial geology map. Depths to bedrock are inferred from logs of wells and test holes and excavations for utility lines and foundations supplemented by data from a contour map of the bedrock surface. Depths own are a generalization of localized highly able conditions and do not include any weathered (decomposed) bedrock. (Woodard-USGS) W75-10954

HIERARCHIAL. MODEL FOR WATER-SUPPLY-SYSTEM CONTROL,

Cambridge Univ. (England). Dept. of Engineering. For primary bibliographic entry see Field 4A. W75-10996

WATER RESOURCE OBSERVATORY CI MATOLOGICAL DATA, WATER YEAR 1973. Wyoming Univ., Laramie. Research Inst. Water

Available from the National Technical Inform tion Service, Springfield, Va 22161 as PB-244 728, \$7.25 in paper copy, \$2.25 in microfiche. Water Resources Series No 49, October 1974, 200 p. OWRT A-999-WY (O(21).

Descriptors: *Data processing, *Climatic data, *Temperature, Humidity, *Data collections, Precipitation(Atmospheric), Precipitation gages, Measurement.

Temperature and relative humidity data that have been reduced from hygrothermograph charts an precipitation data from recording and non-recording precipitation gages are presented in tabular form. Four readings per day at 0600, 1200, 1800, and 2400 hours and the maximum and minimum are presented. The mean, maximum, and minimum temperatures are also shown graphically. The reduced data are transferred to punch cards for computation and tabulating by the University of Wyoming's digital computer. W75-11035

STUDY OF CRITERIA AND MODELS ESTABLISHING OPTIMUM LEVEL OF HYDROGEOLOGIC INFORMATION FOR GROUNDWATER BASIN MANAGEMENT, Minnesota Univ., Minneapolis. Dept. of Geology

and Geophysics.
For primary bibliographic entry see Field 2F.
W75-11042

CK

tts iga

88).

etts

our

on

ga

ar-

and ec-ob-olo-

ogs on

red

ER-

ng.

1.1.

ces

28

ata

ave

SOIL MAP OF THE WORLD, 1:5,000,000, VOLUME IV, SOUTH AMERICA.
Food and Agricultural Organization of the United Nations, Rome (Italy); and United Nations Educational, Scientific, and Cultural Organization, Paris (France).

(France), FAO/Unesco, Paris (France), 1971. 193 p, 8 fig, 3 tab, 2 maps, 103 ref, 1 append.

Descriptors: *Soils, *Maps, *South America, Climates, Vegetation, Geomorphology, Petrology, Land use, Agriculture, Fertility, Water supply, Drainage, Mountains, Soil classification, Soil grops, Soil investigations, Soil properties, Soil surveys, Soil texture, Soil types, Distribution pat-

The 2 map sheets which make up the Soil Map of South America are drawn on topographic base south Atterior are trawn on topographic dase maps of the 1:5,000,000 series of the American Geographical Society Soil units divided into tex-ture and slope classes are marked on the maps by symbols and colors. Text described the developsymbols and colors. Text described the development of the map project, gave notes on uses of the maps, and details environmental conditions and soil uses in South America. The climate, vegetation, geomorphology, and lithology of South America were described and related to soil patterns. A description of the soils of the continent contained an extensive table of soil associations, an account of the distribution of the main soils, and a discussion of land use and soil suitability for agriculture. It was shown that only 5% of the land is under cultivation. Limitations affecting the agricultural use of soils are low natural fertility, poor drainage, and large areas of steeplands. The 10% of South America covered by productive soil regions shows potential for increases in agricultural productions. (Robinson-ISWS)

LAND AND WATER RESOURCES SURVEY IN THE JEBEL MARRA AREA, THE SUDAN. Food and Agriculture Organization of the United

Nations, Rome (Italy).
For primary bibliographic entry see Field 4A.
W75-11139

CONCENTRATION AND GENERA OF ALGAE IN SELECTED ILLINOIS STREAMS, 1971-1973, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 5A. W75-11165

COMPUTER SYSTEMS AND WATER

Polytechnic Institute of New York, Brooklyn; and

Illinois Univ., Chicago. For primary bibliographic entry see Field 6A W75-11174

THE LOUISIANA ENVIRONMENTAL MANAGEMENT SYSTEM AND ITS UTILITY IN WATER RESOURCE PLANNING, Louisiana State Univ., Baton Rouge. Div. of En-

gineering Research. For primary bibliographic entry see Field 5G. W75-11177

DISTRIBUTION-SYSTEM OPERATION ANAL-YSIS MODEL,

Omaha Metropolitan Utilities District, Nebr. Services Dept. For primary bibliographic entry see Field 5D.

COMPUTER ANALYSIS OF WATER-DIS-TRIBUTION SYSTEMS, Springfield Dept. of Water, Light and Power, Ill. For primary bibliographic entry see Field 4A.

W75-11182

ADVANCED TECHNIQUES IN THE MATHEMATICAL MODELING OF WATER-DISTRIBU-

TION SYSTEMS, Beck (R. W.) and Associates, Seattle, Wash. For primary bibliographic entry see Field 4A. W75-11183

CAN A COMPUTER REALLY OPERATE A WATER-FILTRATION PLANT,

Kennedy Engineers, Inc., Tacoma, Wash. For primary bibliographic entry see Field 5F. W75-11184

FINITE-ELEMENT METHOD FOR WATER-DISTRIBUTION NETWORKS, AC1 Environics, Melbourne (Australia).

For primary bibliographic entry see Field 4A. W75-11186

AN ECONOMIC ANALYSIS OF THE POLLU-TION PROBLEMS IN THE COLORADO RIVER BASIN: THE UPPER MAIN STEM SUB-BASIN, Colorado Univ., Boulder.

For primary bibliographic entry see Field 5G. W75-11247

ECONOMICS OF GREAT LAKES SHIPPING IN

AN EXTENDED SEASON, Michigan Univ., Ann Arbor. Dept. of Naval Architecture and Marine Engineering. For primary bibliographic entry see Field 6C. W75-11248

MAKING LOG ANALYSTS OF GEOLOGISTS. Oilweek, Vol 23, No 51, p 27-28, February 5, 1973.

Descriptors: *Analytical techniques, *Data processing, *Exploration, *Mapping, *Logging(Recording), *Resistivity, Porosity, Permeability, Regional analysis, Computer analysis, Data storage and retrieval. Identifiers: Spontaneous potential.

Applying long-standing techniques used in in-terpretation of seismic data to well logs could increase the level of information gained. Automatic scanning systems now offer a highly accurate method of transcribing graphically-recorded log data to a digital tape. Once these are in common use data from logs can be used for more than location of stratigraphic traps. Porosity, apparent water, resistivity, lithology, radioactivity, density, velocity, and ratios of these can be easily assembled and used in regional exploration. Two exam-ples are presented from the Anadarko Basin in western Oklahoma, and from the northeastern Williston Basin in southeastern Saskatchawan. (Bradbeer-NWWA) W75-11288

MULTILAG MARKOV MODELS FOR EAST-

ERN AUSTRALIAN STREAMS, New South Wales Univ., Kensington (Australia). School of Civil Engineering. For primary bibliographic entry see Field 2E. W75-11301

DETECTION OF CHANGE IN SEQUENCES OF HYDROLOGIC DATA, Melbourne and Metropolitan Board of Works

Melbourne and Mettoponian Board of Hold (Australia). K. J. Langford, and R. A. Lewis. In: Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 80-84, May 1975. 2 fig, 6 tab,

Descriptors: "Statistical methods, "Analytical techniques, "Hydrologic data, "Time series analysis, Rainfall, Land clearing, Rain gages. Identifiers: Non-parametric statistics.

The sophistication of techniques used in an analysis should be in keeping with the quality and extent of the data as most hydrologic data are fairly rudi-mentary, for example rain guage measurements, simple analysis techniques are an appropriate first step. Some uses for non-parametric statistics are discussed, with particular emphasis on the detection of change in time sequences. A decrease of 4% in measured rainfall following clearing around a rain gauge was found to be significant. A control record is essential to detect such a small change. Changes of the order of 20% can be detected from individual records. (CSIRO)

GENERATION OF ARID ZONE RAINFALL

University of New England, Armidale (Australia). School of Natural Resources. For primary bibliographic entry see Field 2A. W75-11303

DROUGHTS, DISTRIBUTIONS AND DEPEN-DENCE: AN ANALYSIS OF SOME SYNTHETIC DATA GENERATION METHODS, New South Wales Univ., Kensington (Australia).

School of Civil Engineering. For primary bibliographic entry see Field 2E. W75-11305

AUSTRALIAN ARID ZONE STREANGAUGING, New South Wales Dept. of Public Works, Sydney (Australia). Water Supply and Sewerage Branch. For primary bibliographic entry see Field 2E. W75-11307

WORKSHOP ON COMPUTER-AIDED DESIGN AND SIMULATION OF WASTE TREATMENT

Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate. For primary bibliographic entry see Field 5D. W75-11338

8. ENGINEERING WORKS

8A. Structures

INTERBASIN WATER TRANSFERS: A CASE STUDY IN MEXICO, Resources for the Future, Inc., Washington, D.C. For primary bibliographic entry see Field 4A. W75-10879

PREVENTING BACKFLOW IN PIPING CROSS CONNECTIONS, Watts Regulator Co., Lawrence, Mass.

For primary bibliographic entry see Field 5B. W75-11018

CONSOLIDATION AND REHABILITATION OF

CANALS IN POUDRE VALLEY, Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 4A.

Field 8—ENGINEERING WORKS

Group 8A-Structures

W75-11061

BEACH EROSION CONTROL STRUCTURE,

U.S. Patent No. 3,894,397, 4 p, 9 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 936, No 3, p 829, July 15, 1975.

Descriptors: *Patents, *Beach erosion, *Shore protection, Waves(Water), Ocean waves, Coastal structures Sea walls Identifiers: Hollow concrete blocks.

A beach erosion control structure is described as a perforate wall that includes multiple courses of cored concrete blocks laid on their side so that the core holes provide horizontal passageways through the wall for the flow of water and entrained sand in incoming waves. The multiple rows of such blocks are arranged in such manner that the core holes of adjacent rows of blocks are staggered. The blocks can be preassembled by secur-ing individual blocks into like block units, each block unit having three blocks assembled in a longitudinally staggered side-by-side relationship such that the core holes in adjacent blocks are offset. Such a wall may be laid up without the use of mortar. Instead, mechanical fastening, such as crimped straps, may be employed to couple adjacent courses to each other. Some or all of the block openings may be provided with reed or flapper-type valves which are swung open by an incoming wave, and then move to a partially closed position to resist or restrict the flow of water in ebbing waves. (Sinha-OEIS) W75-11075

COULD THE SEA BE USED TO STORE WATER FOR SUPPLY.--A POSSIBLE SCHEME, For primary bibliographic entry see Field 4A. W75-11129

DESIGN OF THE OPTIMAL OUTFALL SYSTEM FOR A STREAM RECEIVING THER-MAL AND ORGANIC WASTE DISCHARGES, Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization. For primary bibliographic entry see Field 5B. W75-11137

PREDICTING CAVITATION IN SUDDEN EN-LARGEMENTS,

Colorado State Univ., Fort Collins. Hydro Machinery Lab. For primary bibliographic entry see Field 8B. W75-11151

GUIDELINES FOR THE IDENTIFICATION OF POTENTIAL ENVIRONMENTAL IMPACTS IN THE CONSTRUCTION AND OPERATION OF A

RESERVOIR, Illinois Univ., Urbana. Dept. of Forestry. For primary bibliographic entry see Field 5C. W75-11316

8B. Hydraulics

WAVE MOTION IN ROCKFILL, Concordia Univ., Montreal (Quebec). Dept. of For primary bibliographic entry see Field 8D. W75-10924

IMPLICIT NUMERICAL MODELING OF UN-STEADY FLOWS.

North Carolina State Univ., Raleigh. Dept. of Civil Engineering.

M. Amein, and H-L. Chu.

Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No

HY6, Proceedings Paper 11378, p 717-731, June 1975. 9 fig, 3 tab, 16 ref, 2 append. NOAA Contract O-3528

Descriptors: *Unsteady flow, *Numerical analysis, *Open channel flow, Hydraulics, Flow, Open channels, Mathematical studies, Boundary channels, Mathematical studies, Boundary processes, Boundaries(Surfaces), *Model studies, *Hydraulic models. Identifiers: Finite difference analysis.

A numerical model based on the equations of unsteady flow in open channels was used to compute unsteady flows in rivers and Jeservoirs. The cross sections of the waterways ranged from uniform to highly irregular, the type of flow ranged from slowly varied to abrupt changes in discharge, and nearly all combinations of boundary conditions were encountered. The model used an implicit finite difference method. The versatility, accura-cy, stability, and efficiency of the method was demonstrated by field measurements. (Jess-ISWS)

STOCHASTIC ANALYSIS OF PARTICLE MOVEMENT OVER A DUNE BED,

Geological Survey, Bay Saint Louis, Miss. For primary bibliographic entry see Field 2J.

HORIZONTAL GROUNDWATER COLLEC-TORS, HYDRAULICS AND DESIGN, International Water Supply Ltd. Ltd.

(Quebec). P. O. Bourgeois.

In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, Vancouver, British Columbia, p 93-106. 5 fig.

*Water supply, *Grownifers, Wells, Hyd Descriptors: *Groundwater *Aquifers, Wells Hydraulic design, Hydrology, resources, Recharge. Identifiers: *Horizontal groundwater collector.

A horizontal groundwater collector or radial screen well is a large diameter concrete caisson with several screens driven laterally from its lower level outwards through sand and gravel near a stream or lake. It is used to abstract groundwater from an unconsolidated aquifer hydraulically con nected to a body of surface water. A summary is presented of hydrodynamic principles which are used to determine yield, design and development of horizontal groundwater collectors. Field testing and analysis of yield includes: test drilling to establish the real extent of the aquifer and its stratigraphic characteristics; pumping tests to establish the characteristics of the aquifer such as transmissibility, permeability, and coefficient of storage which can then be used to determine the contribution of recharge of the adjacent stream; and, collector yield calculations which involve the above information plus the effective radius of the collector which is defined as the equivalent radius of a vertical well which under the same conditions of drawdown would produce an equivalent yield. Caisson design, lateral drain design, and screens selection are also discussed. Additional research is needed to improve on the methods described for obtaining and using the basic information required in determining the hydraulics for arriving at a col-lector design. (Orr-FIRL) W75-10998

HORIZONTAL GROUNDWATER COLLEC-TORS, 'CANADA'S LARGEST WATER WELL', Prince George City Engineer's Office (British HORIZONTAL Columbia).

In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, Vancouver, British Columbia, p 107-123. 8 fig. Descriptors: *Water supply, *Groundwater resources, *Aquifers, Wells, Costs, Hydrology, Infiltration galleries, Water sources, Potable water, Hydrodynamics, *Water wells, *Canada, *Ca Identifiers: *Horizontal groundwater collectors.

The City of Prince George, British Columbia, initiated planning in 1970 for methods to increase their supply of potable water. The choices in-cluded: duplication of a successful and inexpensive infiltration gallery; a raw water intake from the Nechako River with a conventional water treatment plant; and, groundwater supply from the Nechako Aquifer. The installation of a single collector well with horizontal well screen was chosen as the most viable alternative. Details of the exploratory investigation (test drilling and pumping) and examination of the preliminary hydrogeology are presented. The results established that a groundwater aquifer existed, that the water quality from test pumping was acceptable, that the recharge capability of the aquifer was good and the grain size analysis of the granular soil appeared to be acceptable for a sand-free well development. The design and construction of the collector are outlined. The total project costs were \$1,125,000 or less than ten cents per gallon capacity for the total capital cost of intake, treatment and pumping. It is concluded that the original objectives of Prince George of providing a safe, abundant supply of high quality potable water at the least possible cost has been achieved through the installation of a horizontal collector well. (Orr-FIRL) W75-10999

SOME RESULTS ON MASS TRANSFER PROCESSES IN A DENSITY-STRATIFIED

Mississippi Univ., University. Dept. of Mechanical Engineering.
J. A. Fox, L. A. Roe, and C. V. Alonso

J. A. Fox, L. A. Roe, and C. V. Alonso. Available from the National Technical Informa-tion Service, Springfield, Va. 22161, as PB-244 692, \$3.75 in paper copy, \$2.25 in microfiche. Mis-sissippi Water Resources Research Institute, Mis-sissippi State, Completion Report, August 1975. 26 p, 10 fig, 22 ref. OWRT A-081-MISS(1).

Descriptors: *Flow characteristics, *Density stratification, Diffusion, Shear flow, Lakes, Reservoirs, *Stratified flow, *Mass transfer, Saline water,
*Turbulent flow. *Mixing, Eddies, Turbulence, Identifiers: Richardson number.

A stream of relatively pure water was made to flow over a body of heavier, saline water. The general aim was to study the mixing between the two fluids of different density. This process was investigated in two laboratory flumes and the data were analyzed with a view toward obtaining quantitative estimates of mixing. The main concern in presenting the results is in the relation of the Richardson number to turbulent mixing and the vertical eddy diffusivity coefficient. The existence of a high local Richardson number of a flow of fresh water over a saline solution lower layer in iresn water over a same solution lower layer in the vicinity of the interface between the two layers seems to inhibit turbulent mixing. The local Richardson number approaches zero away from the interface on either side of it. Indirect calculation of the vertical eddy diffusivity coefficient from experimental data shows a strong relation with Richardson number between zero and two for the flows considered, indicating a strong damping with increasing Richardson number W75-11057

EFFECT OF PRESSURE GRADIENT ON WIND-WAVES IN A LABORATORY CHANNEL Connecticut Univ., Storrs. Dept. of Civil En-

gineering.

J. D. Lin, and H. C. Liang.

In: Proc Second US National Conference on Wind Engineering Research, June 23-25, 1975 Fort Collins, Colorado, Colorado State University, 3 p, 7 fig, 1 tab, 10 ref. OWRT A-021-CONN(3), 14-01-

Descriptors: *Wind tides, *Turbulent boundary layers, Laboratory tests, Channels, *Open chan-

identifiers: *Wind-generated waves, Boundary layer pressure gradient, Wind-wave channels, Aerodynamic roughness, Two phase flow, Boun-

The results derived from a wind-wave channel study of the effect of pressure gradient on the characteristics of wind-generated waves are presented. The results indicate that a mild pressure gradient normally existing in a wind tunnel of uniform cross section with a solid flat bottom is olified when the bottom is replaced by a water surface. The pressure gradient also caused an excessive 'set-up' of water surface. The favorable (negative) pressure gradient renders a positive streamwise shear stress gradient which might be responsible in part for the larger growth rate of wind-waves in addition to the component due to direct energy transfer. (deLara-Connecticut)

HYDROLOGIC INVESTIGATION AND DESIGN OF URBAN STORMWATER DRAINAGE

Snowy Mountains Engineering Corp., Canberra (Australia)

For primary bibliographic entry see Field 4A.

APPLICATION OF ELECTRICAL ANALOGY TO DRAW FLOW NETS FOR SUDDEN DRAW-DOWN CONDITIONS IN EARTH DAMS,

University Coll. of Engineering, Burla (India). Dept. of Civil Engineering. L. S. Joshi, and A. P. Misra.

Indian Geotechnical Journal, Vol 4, No 4, p 323-338, October 1974. 7 fig, 6 ref.

Descriptors: *Earth dams, *Slope stability, *Flow nets, *Phreatic lines, *Boundary processes, *Analog models, Laboratory tests, Methodology, Laboratory tests, techniques, Drawdown.

Identifiers: *Sudden drawdown, Electrical analo-

gy, Equipotential lines.

Flow nets are needed to make an accurate analysis of the stability of the water retaining face of an earth dam for sudden drawdown conditions. Flow of water in the body of the dam is in a transient state then. The nature and movement of the saturation line with elapsed time has been studied using a viscous fluid model. Such studies showed that the free saturation line at any instant is a flat parabola. Drawing of flow nets for sudden drawdown conditions was suggested with the help of electrical analogy apparatus. The laboratory apparatus and the procedural steps for drawing flow nets were detailed and exemplified. (Singh-ISWS)

EFFECTS OF ENTRANCE LOSS ON HARBOR

OSCILLATIONS, Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering. U. Unluata, and C. C. Mei.

2

m

Journal of the Waterways, Harbors and Coastal Bullian of the waterways, narrous and Coastai Engineering Division, American Soceity of Civil Engineers, Vol 101, No WW2, Proceedings Paper 11287, p 161-180, May 1975. 4 fig, 2 tab, 14 ref, 2 append. ONE Contracts NO0014-67-A-0204-0036, NR 062-338.

Descriptors: *Waves(Water), *Harbors, *Friction, "Laboratory tests, "Mathematical studies, "Resonance, Velocity, Head loss, Coastal en-gineering, Tsunamis, Fluctuations. The results of a theoretical study of wave induced response in a rectangular model harbor was reported. It was assumed that friction head loss was present across the harbor entrance. The loss was assumed to be quadratic in local velocity with a constant friction coefficient. Bottom and side-wall dissipation were not considered. It was shown that odd higher harmonics were present. resonance characteristics of the fundamental harmonic response in the harbor were significantly in-fluenced by the additional damping due to friction, especially for the lowest peaks. While in the perfect fluid theory, these peaks heighten with diminishing entrace width; in the presence of friction, the opposite was true for a sufficiently nar-row mouth. (Bhowmik-ISWS)

TURBULENT STRUCTURE NEAR SMOOTH BOUNDARY.

Stone and Webster Engineering Corp., Denver, Colo

P. H. Blinco, and D. B. Simons.

Journal of the Engineering Mechanics Division, Proceedings of American Society of Civil Engineers, Vol 101, No EM3, Paper 11372, p 241-255, June 1975. 11 fig, 16 ref, 2 append.

Descriptors: *Turbulence, *Boundary layers, *Time series analysis, *Flow characteristics, Reynolds number, Laboratory tests, Analysis, mechanics, Shear stress, ries(Surfaces), Shear, Anemometers.
Identifiers: *Turbulent structure, *Energy spec-

tra, Boundary shear, Hot film anemometers.

Digital time series analysis of constant temperature hot film anemometer signals were analyzed for a Reynolds number range from 18,600 to 136,000. A miniature boundary layer type sensor and a Flush Surface Hot-Film sensor were used in a smooth boundaried tilting flume. Results of the analysis revealed that: (1) the instantaneous boundary shear stress was a low frequency process with most of its spectral energy associated with frequencies below 5 Hz; (2) the spectral distribu-tions were dependent on the bulk flow variables with higher frequency energy content increasing with increasing Reynolds number; (3) decomposi-tion of the instantaneous boundary shear stress into an extreme value counting process was shown to agree with the so-called 'bursting process'; (4) the mean period between shear stress excursions varied with the 3/4 power of the Reynolds number and, when made dimensionless by use of the bulk flow variables, the mean bursting was a constant; and (5) time-space correlation between the longitu-dinal velocity fluctuations and the boundary shear stress indicated that a large inclined turbulent structure was responsible for the transfer of turbulence into the viscous sublayer. (Adams-ISWS) W75-11148

TRANSITION IN OSCILLATORY FLOW OVER RIPPLED BEDS,

Cambridge Univ., (England). Dept. of Engineer-

ing. J. F. A. Sleath.

The Institution of Civil Engineers Proceedings, Part 2, Research and Theory, Vol 59, p 309-322, June 1975. 7 fig, 1 tab, 13 ref.

Descriptors: *Turbulent flow, *Transition flow, *Laminar flow, Fluid mechanics, Anemometers, Reynolds number, Hydraulics, Hydrodynamics, Beds, Ripple marks, Sand waves, Velocity. Identifiers: *Oscillatory flow, *Rippled bed, Flow stability, Velocity measurements, Random insta-

Velocity measurements were made in order to investigate the way in which oscillatory flow over rippled beds become turbulent. The tests were carried out with a range of rippled beds oscillated in still air and water and a hot wire anemometer was used to measure the velocity. For a given bed and amplitude of oscillation, it was observed that below a certain critical frequency of oscillation the flow remained laminar. At higher frequencies ran-dom instabilities appeared. Depending on the am-plitude of oscillation, these instabilities may reach limiting value as frequency is increased still further, or they may eventually break down into turbulence. A curve was proposed for the conditions under which the random instabilities first appeared. Conclusions were drawn as to the conditions under which flow produced by wave action over a rippled bed is laminar or turbulent. It was suggested that the observed instability is in-dependent of transition caused by grain roughness, which may be calculated separately.
(Lee-ISWS)

THE DESIGN OF STORM WATER DRAINAGE CHANNELS USING MATHEMATICAL MODEL

Hydraulics Research Station, Wallingford (England).

W. R. White, and R. K. Price.

The Institution of Civil Engineers Proceedings, Part 2, Research and Theory, Vol 59, p 91-102, March 1975. 8 fig, 3 tab, 9 ref, 1 append.

Descriptors: *Storm runoff, *Storm *Urban drainage, *Urban hydrology, *Mathematical models, *Open channel flow, Urban runoff, Open channels, Routing, Unsteady flow, Continuity equations, Momentum equation, Flood routing, Drainage systems, Networks, Hydrographs.
Identifiers: *Colebrook-White transition. *Airport

The hydraulic aspects of the design of drainage schemes, the main arterial branches of which con sist of open channels, were described. The Road Research Laboratory hydrograph technique was applied to the subsidiary pipe network system, but a new mathematical model technique was used for the main drainage channels. The spatially varied unsteady flow conditions within these channels were analyzed using a full solution of the equations governing continuity, momentum, and frictional resistance, the latter being defined in terms of the Colebrook-White transitional law. The new method was used in a feasibility study to deter-mine the optimum drainage system for the proposed Maplin airport-seaport development and results from this investigation illustrated the method. (Terstriep-ISWS) W75-11150

PREDICTING CAVITATION IN SUDDEN EN-LARGEMENTS.

Colorado State Univ., Fort Collins. Hydro Machinery Lab. J. W. Ball, J. P. Tullis, and T. Stripling.

Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY7, Paper 11442, p 857-870, July 1975. 5 fig, 2 tab, 17 ref. 2 append.

Descriptors: *Cavitation, *Pitting(Corrosion), *Orifices, *Hydraulics, Energy dissipation, Valves, Pressure, Water conveyance, Nozzles, Water levels, Damages, *Design criteria, *Forecasting.
Identifiers: *Scaling effects, *Pressure effects.

In recent years incipient, critical, and choking cavitation levels have been introduced as design criteria for orifices and valves in pipelines. Recent studies have evaluated a fourth level, incipient cavitation damage, for orifices that is applicable to the design of sudden-enlargement energy dissipa-tors. Design data for these four levels were included in the paper. Since cavitation in prototype structures can differ from that predicted by model studies, research was also directed toward evaluation of scale effects. The existence of scale effects due to pressure, size, and geometry for four levels

Field 8—ENGINEERING WORKS

Group 8B-Hydraulics

of cavitation was examined herein, and methods and equations for adjusting reference test data to structures of other sizes operating under different pressure conditions were presented The location and distribution of cavitation pitting on the pipe wall downstream from the sudden enlargement was identified. The pitting was a function of expansion ratio and cavitation intensity. (Lardner-ISWS) W75-11151

CAVITATION CONTROL BY AERATION OF HIGH-VELOCITY JETS, Bureau of Reclamation, Denver, Colo. Hydraulics

G. L. Beichley, and D. L. King. Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol 101, No HY7, Paper 11462, p 829-846, July 1975. 10 fig, 1

ref, append.

Descriptors: *Cavitation, *Outlet works, *Flow around objects, *Hydraulic models, *Slide gates, Hydraulic structures, Jets, Discharge(Water), Spillways, Aeration, Erosion.

Identifiers: *Offsets, Palisades Dam, Navajo Dam, Pueblo Dam, Crystal Dam, Teton Dam, Slots, Deflectors.

To prevent cavitation erosion, air may be introduced along the underside and sides of a jet before the jet comes in contact with downstream concrete surfaces. Model studies of chute offsets. air slots, and deflectors were conducted to deter-mine methods to aerate the jet and provide recommendations for altering two existing structures and designing new structures. A single test facility was used to model existing structures at Palisades and Navajo Dams and proposed structures at Pueblo, Crystal, and Teton Dams. Wall air vent slots combined with a floor deflector were developed for use immediately downstream from the gate frames in the two existing structures. Wall and floor air vent offsets away from the flow at the end of the frame were developed for new structures. These investigations, supplemented by general tests, formed the basis for guidelines developed for design of future air-entraining devices to protect flow surfaces from cavitation erosion. The best dimensions and locations for the slots and offsets were discussed, based on models of these specific structures. (Lardner-ISWS)

DERIVATION OF SURFACE WATER LAG TIME FOR CONVERGING OVERLAND FLOW. New Mexico Inst. of Mining and Technology, Socorro.

For primary bibliographic entry see Field 2E. W75-11156

MASS-EMPLACED SAND-FINGERS AT MARAROA CONSTRUCTION SITE, SOUTHERN NEW ZEALAND, Otago Univ., Dunedin (New Zealand). Dept. of

Geology. For primary bibliographic entry see Field 2J. W75-11161

SIZE-SORTING DURING SUSPENSION TRANS-PORTATION-LOGNORMALITY AND OTHER

Indian Statistical Inst., Calcutta. Geological Studies Unit.

For primary bibliographic entry see Field 2J. W75-11162

INVESTIGATION OF THE OPERATING CHARACTERISTICS OF THE IOWA SEDI-MENT CONCENTRATION MEASURING

Iowa Univ., Iowa City. Inst. of Hydraulic Research. For primary bibliographic entry see Field 2J.

W75-11163

LABORATORY INVESTIGATION OF ONE-DIMENSIONAL WAVE MOTION IN OPEN CHANNELS.

Tennessee Univ., Knoxville. Coll. of Engineering. W. A. Miller, Jr., and B. A. Tschantz.

Paper presented at National Water Resources Engineering Meeting, American Society of Civil Engineers, Atlanta, Georgia, January 25, 1972. 40 p. 16 fig, 24 ref. OWRT B-010-TENN(2), B-012-TENN(2), and B-005-TENN(4).

Descriptors: *Waves(Water), *Open channel flow, Hydraulic transients, Unsteady flow, Velocity, Flow, Surges, Bores, Dam failure.

A three-year (1968-71) study is described in which laboratory measurements of some of the characteristics of one-dimensional waves in a channel were compared with values computed from a parmathematical model and solution procedure. When boundary conditions, initial conditions, and channel geometry are accurately specified as input to the mathematical nodel, the leap-frog explicit solution scheme provides an ac-curate representation of the physical situation. The hydrogen bubble technique is a practical and feasible method for determining velocities in un-steady flow. Within the limits of the test data, neither the amplitude of the wave released into the channel nor the initial depth of water in the channel had an appreciable effect on the agreement between computed and measured values. For wave releases into a steady flow, proper specification of initial and boundary conditions for the model becomes more critical, and accurate experimental measurements are more difficult to obtain. W75-11172

IMPROVED DESIGN OF DISTRIBUTION NET-WORKS BY MINIMUM ROUTE,

Nihon Suido Consultants Co., Tokyo (Japan). For primary bibliographic entry see Field 4A. W75-11175

FINITE-ELEMENT METHOD FOR WATER-DISTRIBUTION NETWORKS,

AC1 Environics, Melbourne (Australia). For primary bibliographic entry see Field 4A.

APPROXIMATION FOR STEADY INTERFACE BENEATH A WELL PUMPING FRESH WATER OVERLYING SALT WATER,

New Mexico Inst. of Mining and Technology, Socorro. For primary bibliographic entry see Field 4B. W75-11255

COLORADO CITY SOLVES ITS SAND PUMP-ING PROBLEMS.

Wright Water Engineers, Inc., Denver, Colo. For primary bibliographic entry see Field 8C. W75-11261

FORMULATION OF BOUNDARY CONDITIONS AT THE SURFACE OF A POROUS MEDIUM,

Alberta Univ., Edmonton. G. Neal, and W. Nader.

Society of Petroleum Engineering Journal, Vol 14, No 5, p 434-436, October, 1974. 1 fig, 2 tab, 11 ref.

*Flow, *Boundaries(Surfaces), Aquifers, Filters, Porosity, Hydraulic conductivity, Flow system, Interfaces, Mathematical models, Darcy's law, Boundary layers, Hydraulics, Flow profiles, Transmis-

Identifiers: *Boundary conditions, Tangential velocity, Flow through a porous medium

The governing flow equations in prediction of fluid flow occurring within adjacent regions of porous medium and open space are Darcy's Law and the Navier-Stokes equation. The boundary conditions usually assumed are that the mass flux normal to the surface is continuous, that the pressure is continuous across the surface, and that the tangential velocity in the free fluid tends to zero at the surface. The last assumption is an approximation. It is tested by comparison with two more explicit assumptions; confirmation of the approximation is the result. (Bradbeer-NWWA) W75-11269

THE MECHANICS OF ROCK FAILURE DUE TO WATER JET IMPINGEMENT,

Bell Telephone Labs., Inc., Whippany, N.J. For primary bibliographic entry see Field 8E. W75-11272

ANALYSIS OF FACTORS INFLUENCING MO-BILITY AND ADSORPTION IN THE FLOW OF POLYMER SOLUTION THROUGH POROUS MEDIA.

Shell Oil Co., Houston, Tex. G. J. Hirasaki, and G. A. Pope.

Society of Petroleum Engineers Journal, Vol 14, No 4, p 337-346, August, 1974. 8 fig. 7 tab, 25 ref.

Descriptors: Porous media, *Polymers, *Flow, Secondary recovery(Oil), Fluid mechanics, Injection, Oil wells, Adsorption, Chemistry, Organic molecules, Flooding, Oil fields, Oil reservoirs, Water wells, Groundwater, Aquifers, Reservoirs, Flow augmentation, Permeability, Porosity, Clogging.

Identifiers: Pseudoplastic flow, Viscoelastic flow, Blake-Kozeny mode(Flow).

Displacement of oil by polymer solution has characteristics not present in normal water flooding. Rheological behavior of the flow could be Newtonian at low flow rates, pseudoplastic at medium flow rates, and dilatant at high flow rates. The pseudoplastic behavior is modeled with the Blake-Kozeny model. The dilatant behavior is modeled with the viscoelastic properties of the polymer solution. Permeability reduction may be due to an adsorbed layer of polymer molecular coils that reduces effective pore size. The ratio of the size of the polymer molecular coil to an effec-tive pore radius of the medium is used to correlate the permeability reduction factor with the polymer, brine, and rock properties. A model has been developed to represent adsorption as a function of these properties assuming the polymer is adsorbed as a monolayer of molecular coils that have a segment density greater than the molecular coil in dilute solution. (Bradbeer-NWWA) W75-11275

HOW TO SEAL TUBING COLLAR LEAKS. For primary bibliographic entry see Field 8C. W75-11287

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING; PART 4: FALLS IN OVERPRESSURE PREDICTION, Continental Oil Co., Ponca City, Okla. Production Research Dept.
For primary bibliographic entry see Field 8G. W75-11294

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING; PART 5: PRE-DICTING HYDROCARBON ENVIRONMENTS WITH WIRELINE DATA,

Continental Oil Co., Houston, Tex. Production Engineering Services. For primary bibliographic entry see Field 8G. W75-11295

ENGINEERING WORKS—Field 8 Hydraulic Machinery—Group 8C

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING; PART 6: COR-RELATING GEOPRESSURE GRADIENTS WITH HYDROCARBON ACCUMULATIONS, Continental Oil Co., Houston, Tex. Production

Engineering Services. For primary bibliographic entry see Field 8G.

W75-11296

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING; PART 7: THE SHALE RESISTIVITY RATIO - A VALUABLE TOOL FOR MAKING ECONOMIC DRILLING

Continental Oil Co., Houston, Tex. Production

Engineering Services

For primary bibliographic entry see Field 8G. W75-11297

8C. Hydraulic Machinery

EXPERIMENTAL STUDY OF THE COOLING WATER SYSTEM, SETUBAL POWER PLANT, RIO SADO, PORTUGAL,

Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.

For primary bibliographic entry see Field 5B. W75-10855

ADJUDICATING TENDERS FOR AERATION DEVICES: BEST VALUE AND RELIABILITY, For primary bibliographic entry see Field 5D W75-10972

PUMP SELECTION.

Associated Engineering Services Ltd., Vancouver (British Columbia). R. Walker.

In: Proceedings of the Annual Conference of the British Columbia Water and Waste Association, April 9-11, 1974, Vancouver, British Columbia, p 41-56. 7 fig, 5 ref.

Descriptors: *Pumps, *Waste water treatment, *Sewage treatment, *Equipment, *Costs, *Sewage treatmer Sewerage, Pumping.

Since pumping water and waste water adds only to the cost and not to the value of a product, it is imperative that the pumping cost should be as low as possible. The four major factors in the cost structure of pumping are installed cost-amortization, power or fuel costs, supervision and maintenance, and, the cost of down time and standby equipment. In comparison to the overall cost of the entire installation the actual cost of the pumps and motors is a relatively small item. It is better to buy equipment which may not be the cheapest but which will cost less in terms of fewer repairs and less maintenance. Future expectations of rising fuel costs necessitate that good system design be implemented to insure that the best possible use is made of the purchased energy. Down time of the system can be minimized with the installation of three pumps rather than the conventional two (one pump running, one down for maintenance, and the third unit in standby in case the operating unit fails). Well pumps can either be vertical turbines or submersible pumps. If vertical turbine pumps are to be used, then a profile should be made of each well upon completion. The traditional booster pumps are horizontal, double suction closed impeller centrifugal pumps. The shaft diameter and the distance from center to center of the bearing pedestals are the parameters to consider when choosing these pumps. The selection of the appropriate pumps for sewage transport is also discussed, as well as the various makes of com-minutors and self cleaning bar screens that have been designed to aid in sewage transport. (Orr-FIRL) W75-11002

NOZZLE HYDRAULICS IN THE TRICKLE IR-RIGATION SYSTEM--RELATION BETWEEN WATER TEMPERATURE AND NOZZLE FLOW

RATE (IN JAPANESE), Tottori Univ. (Japan). Sand Dune Research Inst. For primary bibliographic entry see Field 3F. W75-11096

A SOLUTION TO PUMP STOPPAGES,

Irvine Ranch Water District, Calif.

S. Nelson

Water and Sewage Works, Vol 121, No.9, p 106, September 1974.

Descriptors: *Pumps, *Sludge digestion, Solids, Flow, *Sewage treatment, *Waste water treatment, Treatment facilities, Equipment.

Identifiers: Comminutor/Macerator, Irvine Ranch Water District.

One problem in sludge digestion and treatment is the stoppage of waste pumps. This is caused by large articles such as cans, bottles, rags, and sticks which get pumped along with primary sludge to an aerobic digester, then to drying beds where they cause the pumps to become inoperative. The Irvine Ranch Water District has solved this problem by the use of a new unit called the Disposable Waste Systems Comminutor/Macerator, installed in the influent channel. This six inch model processes solid material prior to any pump action. The unit can run unattended for several months. The Irvine Ranch Water treatment plant has been using this machine for eight months continuously. Primary sludge and skimming pumps that feed the Comminutor/Macerator share a common discharge line; flow can be to both pumps at once or to either individually. Three new Communi-Comminutor/Macerator tor/Macerators, 40 inch models, will be installed in the system in the near future. (Prague-FIRL)

DEVICES: THE MANUFAC-AERATION TURER'S VIEWPOINT,

For primary bibliographic entry see Field 5D. W75-11121

CAVITATION CONTROL BY AERATION OF HIGH-VELOCITY JETS,

Bureau of Reclamation, Denver, Colo. Hydraulics Branch.

For primary bibliographic entry see Field 8B.

CAN A COMPUTER REALLY OPERATE A WATER-FILTRATION PLANT.

Kennedy Engineers, Inc., Tacoma, Wash For primary bibliographic entry see Field 5F. W75-11184

A PNEUMATIC SYSTEM TO PUMP WATER FROM PIEZOMETERS,

Department of the Environment, Lethbridge (Alberta). Research Station. T. G. Sommerfeldt, and D. E. Campbell.

Ground Water, Vol 13, No 3, p 293, May-June, 1975, 2 fig.

Descriptors: *Pump, *Piezometers, *Water pressure, *Hydraulic equipment, Measurement, Research equipment, On-site equipment, Design. Identifiers: *Pneumatic pump.

A system to pump water from piezometers is operated by compressed air. It is especially useful where maximum suction lift, 32.5 feet at sea level, is exceeded and the casing is smaller than 3 inches. The pump is described and diagrammed. It has performed satisfactorily without air leakage.
(Bradbeer-NWWA)

PITLESS ADAPTERS: EMPHASIS ON SANITA-TION.

Environmental Protection Agency, Washington, D.C. Div. of Water Supply. W. J. Witsell.

Water Well Journal, Vol 29, No 4, p 56-58, April, 1975, 1 fig.

Descriptors: *Casings, *Wells, *Well regulations, *Pollution, Frost protection, Corrosion, Quality control, *Environmental sanitation.

Identifiers: *Pitless adapters, *Well pits, Pitless units, Poisonous gases, Well head.

Because of the pollution hazards involved, a well pit to house pumping equipment or to permit ac-cessibility to the top of a water well is not recommended and, in some cases, is prohibited. The two general types of pitless installations are the pitless adapter, which connects the well from below the frost line to the pumping components, and the pitless unit which is an entire unit mounted on the well casing that has been cut off at the required depth. Problems of installation in this type of equipment often arise. Welding below ground is not conducive to good workmanship. Similarly, achieving a watertight joint is difficult. Clamps and gaskets for attachment of adapters and units are often criticized for their structural weakness. Compatibility between metals on the well, the pitless device, and the welding materials is necessary. Finally, provision for settlement of the well head is necessary. Procedures for inspecting and testing the pitless installations are important as they are installed within the zone of greatest corro-sion and contamination potential within the upper 10 feet of the well structure. Testing procedures are outlined. (Bradbeer-NWWA)

LONGER LIFE FOR SUBMERSIBLES. For primary bibliographic entry see Field 8G. W75-11259

ELECTRICAL TESTS FOR SUBMERSIBLE PUMPS.

For primary bibliographic entry see Field 8G. W75-11260

COLORADO CITY SOLVES ITS SAND PUMP-ING PROBLEMS,

Wright Water Engineers, Inc., Denver, Colo. R. D. Tafelski.

Johnson Drillers Journal, p 1-3, March-April, 1975. 2 fig.

Descriptors: *Groundwater, *Sands, *Pumping, *Quality control, *Well filters, Well casings, Well screens, Gravels, Wells, Water wells, Sand aquifers, Filters, Silting, Sediment control, aquifers, Colorado.

Identifiers: *Burlington(Colo), *Sand pumping, Ogallala aquifer, Pierre shale.

Investigations into the problem of sand pumping wells in Burlington, Colorado were made in 1973. Initial pumping in each well produced sand. Continued pumping reduced the amount of sand. As the problem worsened with time, the decision was made to drill a series of replacement wells. The new wells completely pierced the Ogallala and continued five feet into the Pierre shale. The size of the gravel pack was reduced and polyphosphates were introduced to aid in breaking down any mydorke on the bestable wells. The down any mudcake on the borehole walls. The well was developed with careful backwashing to prevent the disruption of the gravel pack. The resulting wells produced sand-free water. (Bradbeer-NWWA) W75-11261

WILL SUBMERSIBLES MAKE JET PUMPS OB-

Water Well Journal, Vol 29, No 4, p 53-54, April,

Field 8-ENGINEERING WORKS

Group 8C-Hydraulic Machinery

Descriptors: *Pumps, *Cost comparison, *Cost analysis, Jets, Hydraulic equipment, Equipment,

Performance, Deep-well pumping. Identifiers: *Submersible pump, *Injector pump, *Ejector pump, Jet pump, Working head pump.

A comparison of the relative costs, capacities and working depths of the three types of pumps, working head, ejector and submersible, is made. Costs of installation are competitive at settings from 100 to 500 feet. The jet pump, or ejector alone, is cheapest but its cost rises when the cost of extra pipe length is added. The submersible pump is the most costly to manufacture but requires less pipe and cable to operated. The installation, access and repair of the jet pump are simplest of the three; but it has limitations as to the depth of installation. In wells of 4-inch diameter or larger and settings below 80 feet, the submersible pump develops the greatest volume of water per horsepower. The deeper the setting, the greater the capacity and horsepower advantage for the submersible. The deep well working head pump can be used in wells of narrower diameter. For wells of less than 100 feet, the ejector pump is best in price, capacity and installation case. (Bradbeer-NWWA) W75-11263

INSTALLING SUBMERSIBLES.

Water Well Journal, Vol 29, No 4, p 47-48, April,

Descriptors: *Pump testing, *Pumps, Planning, Loads(Forces), Well capacity, Aquifer properties, Power lead, Performance, Quality control, Hydraulic systems, Wells, Safe yield, Specific capacity.

Identifiers: *Submersibles, *Downhole pumping

Proper planning and preparation are very important to the successful installation of a submersible pump and provide the best insurance against lost time on the job of installation. Well capacity should be predetermined to prevent over-pumping. should be predest mined to prevent over-pulmping pre-pre-installation checks of voltage capacity prevents burnouts. Other checks on wire size, length and placement of splices are common sense. A pump should be handled carefully and tested fully placing it downhole. Some tests for shipping damage are suggested. Once the submer-sible is emplaced careful operation should be the rule to insure maximum lifetime of the pump. (Bradbeer-NWWA)

UNCONVENTIONAL AIR DRILLING REDUCES WELL COSTS.

World Oil, Vol 178, No 7, p 91-93, June, 1974. 2

Descriptors: *Drilling, *Costs, Groundwater, Drilling equipment, Test wells, Borehole, Drilling

Identifiers: *Air drilling, Drilling techniques.

Data including penetration rates, number of bits per hole and a description of the cored formation as well as the drill bit types and sizes, pressures used and weight of the bits are tabulated and eval-uated for two recent exploratory drilling programs by Shell Oil Company that involved air drilling. The costs reported illustrate the economic advantages of air drilling. (Bradbeer-NWWA) W75-11270

DRILLING RATE AFFECTS COSTS MORE THAN BIT LIFE,

Sandia Labs., Albuquerque, N. Mex. R. J. Lawrence.

Oil and Gas Journal, Vol 73, No 22, p 130-132, June 2, 1975. 3 fig, 4 ref.

Descriptors: *Drilling equipment, *Cost analysis Economics, Evaluation, Equipment, Cost-benefit analysis, Wells, Efficiencies, Groundwater, Oil. Identifiers: *Drilling rate, *Drill bit design, Cost

To simplify the economic evaluation of drilling costs it can be assumed that logging, casing, and completion costs are essentially fixed and independent of both drilling rate and drill bit life, the two areas open to improvement. Rotating and tripping costs are thus the only factors considered. Drilling rate is more significant than improved bit life from an economic point of view. Two examples to demonstrate this fact are given. (Bradbeer-NWWA) W75-11279

'SELF-TAPPING SCREW' BIT WOULD USE LIGHTER WEIGHTS,

J. L. Kennedy

Oil and Gas Journal, Vol 72, No 13, p 122-126, April 1, 1974. 11 fig. 1 ref.

Descriptors: *Drilling equipment, *Design criteria, *Penetration, *Weight, Pressure, Wells, Ground-water, Rotary drilling, Water wells. Identifiers: *Drill bit, *Conical bit, Drilling rate.

A conical bit which uses its cutting to generate thrust forces is the basis of a program to develop a new boring technique. Because of the forces the bit requires only about 10% of the thrust of a conventional bit of similar diameter. The shape of the bit provides more cutting structure and produces a wedge-like effect on the rock. Cleaning should be improved as rock chips would not be caught under the bit. Also, if the side force generated is large enough or if the hole-bottom angle is small enough, the borer can be made self-advancing Tests indicate the advantages of the conical bit. (Bradbeer-NWWA) W75-11283

HOW TO SEAL TUBING COLLAR LEAKS. Petroleum Engineer, Vol 45, No 6, p 66, June,

Descriptors: *Leakage, *Water wells, *Oil wells, *Linings, Technology, *Texas, Pressure Methodology, Seepage.
Identifiers: *Tubing collar, Bee County(Tex).

The technical solution to an actual problem case in Bee County, Texas is discussed. A leak in 2-inch tubing collar at 448 feet with tubing pressure 4150 psi and casing pressure 2000 psi was repaired in 5 hours with a 10-foot long steel liner. (Bradbeer-NWWA) W75-11287

WATER SYSTEM ACCESSORIES.

Water Well Journal, Vol 29, No 4, p 50-51, April,

Descriptors: "Water supply development, "Pumps, "Water pressure, "Public utilities, Over-flow, Water rates, Water utilization, Water Identifiers: *Water system accessories, Pressure

switch, Relief valve, Pressure tank

A pump alone cannot provide automatic running water under pressure in all cases. Certain other accessories are needed and the combination of these forms a water system. The motor, the pressure switch, the relief valve, and the pressure tanks are basic components of a water system and provide the regulation of the amount of water pumped. A formula for estimating the pressure tank size necessary is presented, and examples are given. A larger than normal tank can be used to increase the useable volume of water in a slow producing well. An example of this is given. (Bradbeer-NWWA) W75-11299

8D. Soil Mechanics

WAVE MOTION IN ROCKFILL,

Concordia Univ., Montreal (Quebec). Dept. of

Civil Engineering.
M. S. Nasser, and J. A. McCorquodale.
Journal of the Waterways, Harbors and Coastal
Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No WW2, Proceedings Paper 11286, p 145-159, May 1975. 7 fig, 21 ref, 2 append.

Descriptors: *Breakwaters, *Waves(Water), *Coastal engineering, *Dams, *Darcys law, Com-puters, *Mathematical models, Rockfill dams, Hydraulics, Porous media, Dispersion, Energy, Equations. Identifiers: *Finite differences.

A mathematical model, coupling an external nonlinear wave and the resulting internal flow in a rockfill embankment with an impervious core was presented. The method of characteristics along with a finite difference scheme were utilized in the numerical solution. The model dealt with the non-darcy flow regimes but could be simplified to treat Darcy flow. Wave experiments on various rectangular rockfill embankments were described. The numerical solutions for typical slow and fast drop cases were compared with the corresponding experimental results. The theoretical and experimental wave transmission curves, reflection coeffi-cients, and run-up values were shown to be in good agreement. (Bhomik-ISWS) W75-10924

APPLICATION OF ELECTRICAL ANALOGY TO DRAW FLOW NETS FOR SUDDEN DRAW-DOWN CONDITIONS IN EARTH DAMS, University Coll. of Engineering, Burla (India). Dept. of Civil Engineering. For primary bibliographic entry see Field 8B. W75-11143

GROUND WATER DEPLETION SIDENCE PROBLEMS IN TAIPEI BASIN, National Taiwan Univ., Taipei. Hydraulic Lab. For primary bibliographic entry see Field 4B. W75-11262

8E. Rock Mechanics and Geology

CONTOUR MAP OF THE BEDROCK SURFACE, NEW BRITAIN QUADRANGLE, CON-NECTICUT, Geological Survey, Hartford, Conn. For primary bibliographic entry see Field 7C. W75-10950

MAP SHOWING DEPTH TO BEDROCK, WORTHINGTON QUADRANGLE, SACHUSETTS,

Geological Survey, Boston, Mass. For primary bibliographic entry see Field 7C. W75-10951

MAP SHOWING DEPTH TO BEDROCK, GREENFIELD QUADRANGLE, SACHUSETTS.

Geological Survey, Boston, Mass. For primary bibliographic entry see Field 7C. W75-10952

MAP SHOWING DEPTH TO BEDROCK, CHESTER QUADRANGLE, MASSACHUSETTS, Geological Survey, Boston, Mass. For primary bibliographic entry see Field 7C. W75-10953

MAP SHOWING DEPTH TO BEDROCK, MOUNT CARMEL QUANDRANGLE, CONNEC-TICUT.

Geological Survey, Hartford, Conn For primary bibliographic entry see Field 7C.

THE MECHANICS OF ROCK FAILURE DUE TO WATER JET IMPINGEMENT,

Bell Telephone Labs., Inc., Whippany, N.J. S. E. Forman, and G. A. Secor. Society of Petroleum Engineers Journal, Vol 14, No 1, p 10-18, February, 1974. 10 fig. 2 tab, 17 ref.

Descriptors: *Jets, *Hydraulic mining, *Failure(Mechanics), Stress, Pressure, Rock mechanics, Young's modulus, Poisson ratio, Ten-*Hydraulic sile strength, Porosity, Permeability, Nozzles, Identifiers: *Water jets.

The initiation of fracture in a rock mass subjected to the impingement of a continuous water jet has been studied. The jet is assumed to place a quasistatic pressure loading on the surface of the rock, which is treated as a saturated, porous-elastic, isotropic, and homogeneous half-space. While this pressure loading is held constant, the impinging water flows through the rock according to Darcy's law and pressurizes the fluid in the pores. The pore pressure distribution couples with the stress field due to the surface loading to produce an effectivestress field, which can start tensile fracturing directly under the load. At various time intervals after initial impingement, the effective-stress field is computed using finite element methods and the results, together with the Griffith criterion for tensile failure, produce the loci of the zones of fracture initiation. The behavior of these zones is displayed as a function of the two jet parameters --pressure and nozzle diameter -- and the five rock properties: Young's modulus, Poisson's ratio, tensile strength, porosity and permeability, and time. Experimental verification of the role of pore pressure was made in a laboratory study which is described. (Bradbeer-NWWA) W75-11272

THEORY OF PLASTICITY OF POROUS MEDIA

WITH FLUID FLOW, Rice Univ., Houston, Tex M. Kojic, and J. B. Cheatham, Jr. Society of Petroleum Engineers Journal, Vol 14, No 3, p 263-270, June, 1974. 16 ref.

Descriptors: *Plastic deformation, *Mathematical Descriptors: "Paste deformation, "Mathematical analysis, "Flow, "Viscosity, "Porosity, "Connate water, Structural geology, Deep water, Groundwater, Darcy's law, Mathematical model, Foundation investigation, Dam foundations, Rock mechanics, Rock properties, Porous media. Identifiers: "Thrust fault(Geology).

Plastic deformation of a porous medium containing moving fluid is analyzed as a motion of a solidfluid mixture. The fluid is considered to be Newtonian, and the porous material consists of inter-connected pore spaces and of solid particles that can deform elastically. The effective stress princi-ple and a general form of the yield function -- including work-hardening characteristics -general stress-strain relations are applied to describe the plastic deformation of the solid. The system of governing equations with the number of unknowns being equal to the number of equations is formed. A possible method of solution of a general problem is described. Some simplifications such as the assumptions of quasi-static plastic deformation and incipient plastic deformation with the application of Darcy's law for the fluid flow are discussed. To illustrate an application of the theory, the problem of incipient plane plastic deformation of a Coulomb material is presented. (Bradbeer-NWWA)

8F. Concrete

TECHNIQUES FOR LINEAR TIE-BACK CE-

MENTING, MWL Tool and Supply Co., Midland, Tex.

H. E. Lindsey, Jr. Petroleum Engineer, Vol 45, No 7, p 40-44, July, 1973, 1 fig.

Descriptors: *Linings, *Well casings, *Cements, Circulation, Sealants, Water wells, Oil wells, Deep wells, Groundwater, Leakage.

Identifiers: *Cementing, *Casing, strings, Cement placement.

Tie-back liners or casing strings are cemented to protect other casing in the well against pressure or corrosion, to close a leak, to add to confining strength or to cover worn or damaged casings. A tie-back liner usually extends from the top of a liner back to the surface but may extend only par-tially up the hole from the production liner. The two methods of cement placement around tie-back strings are by: (1) conventional circulation; and (2) reverse circulation. The equipment is different for each method. Which of these procedures is better is determined by the job requirements. (Bradbeer-W75-11277

HOW BP ALASKA CEMENTS THROUGH PER-

MAFROST. Petroleum Engineering, Vol 45, No 4, p 38-42, April, 1973, 2 fig.

Descriptors: *Cements, *Mixing, *Permafrost, *Tundra, *Alaska, Oil wells, Technique, Portland cements, Gypsum, Concrete technology. Identifiers: North Slope(Ala), Prudhoe Bay (Alas).

The approximately 2000 foot thick permafrost of Alaska's North Slope creates a unique problem in drilling methods and cement placement. Gypsumportland cement blends offer an effective cement mixture of usage through permafrost because of their low heat of hydration, stability in freezethaw cycles, and wide range of temperature usage. Surface techniques and mixing equipment are described. The inner string cementing technique is used to cement the open hole. This technique along with precautions due to low temperatures is described. Also, three main types of batch mixing are evaluated for use at low temperatures. (Bradbeer-NWWA) W75-11278

HOW TO MAKE SQUEEZE CEMENTING SUC-CESSFUL,

Rike Service, New Orleans, La. J. L. Rike.

Oil and Gas Journal, Vol 72, No 26, p 58-64, July 1, 1974. 3 fig, 3 tab, 20 ref.

Descriptors: "Wells, "Cements, "Slurries, "Sealants, "Methodology, Concrete additives, Concretes, Water wells, Well casings, Pipes, Groundwater.

Identifiers: *Squeeze cementing.

Squeeze cementing is an operation wherein cement slurry is forced under pressure to a specific point in a well, in order to repair casing or a cement job, or to seal the formation from well fluids. The significance of the volume of cement used, and of the pressure of the operation is delineated and the uses of high and low pressure squeeze are shown. Materials used as extenders, retarders, dispersants and accelerators in the cement slurry are described and their relative values are men tioned. Special problems that might aris during the operation such as lost circulation are recounted and control methods are suggested. (Bradbeer-

CASING-SEAT TESTING - WHY AND HOW, P. L. Moore.

Oil and Gas Journal, Vol 21, No 32, p 72-74, August 6, 1973. 5 fig.

Descriptors: *Pressure, *Water wells, *Drilling, *Testing, Frequency, *Methodology, Testing procedure, Concrete testing, Non-destructive test ing, Quality control, Measurement, Casing, Well casing.

Identifiers: Leak-off, Casing seat, Fracture gradient

Pressure testing below the casing seat is generally performed to test the cement job, and to determine the fracture gradient in the first sand below the casing shoe. The general procedure is discussed and some examples are given. Special considera-tions in running leak-off tests include the pumping rate, the decision to test, the pressure to be used the frequency of testing and the maximum mud weight. These are discussed. (Bradbeer-NWWA) W75-11291

CEMENTING TODAY'S PROBLEM WELLS. Drilling, Vol 34, No 5, p 20-21, March, 1973

Descriptors: *Cements, Technology, *Concrete technology, *Water wells, additives, *Concrete technology, *Water wells, Linings, Pozzolans, Slurries, Concrete mixes, Concrete placing, Drilling, Casings, Deep wells. Identifiers: *Thixotropic cement, Batch mixing(Cement), Continuous mixing(Cement).

The advantages and disadvantages of batch mixing and continuous mixing cement for use in wells are mentioned. Technological improvements of the continuous mixing process are predicted. problem of cementing hot drill holes is met with a Class J cement in the form of supplements to certain oil well additives. A spacer, a hydrocarbonbased fluid which is compatible with mud and slurry, is credited with improving mud removal. Thixdeveloped to support incompetent formations. (Bradbeer-NWWA) W75-11293 slurries, gelatinous

8G. Materials

ALGORITHMS USEFUL FOR DETERMINING A SUBSURFACE ELECTRICAL PROFILE VIA HIGH FREQUENCY PROBING. California Univ., Livermore. Lawrence Livermore Lab.

D. L. Lager, and R. J. Lytle. UCRL-51748, February 13, 1975. 14 p, 23 fig, 13 ref. ERDA Contract W-7405-Eng-48.

*Algorithms, *Electromagnetic Descriptors: waves, *Geophysics, Computers, Mathematical studies, Mathematics, Electrical well logging, Exploration, *Subsurface mapping.

Identifiers: *High-frequency probing, ART algorithm, SIRT algorithm, BPT algorithm, Resolving power, Convergence rate, Tomography

The data inversion algorithms developed in the last few years by investigators in the field of x-ray tomography for producing 3-D reconstructions of the human head and torso from 2-D projections have been applied to the problem of determining the structure of the ground between a pair of drill holes. The 'projections' were made by probing the ground at high frequencies and recording the magnitude and phase of the received signal for various positions of transmit and receive antennas. The region between the holes was divided into rectangu-lar zones (like a checkerboard) and several algorithms were applied to assign appropriate values of electrical permittivity and skin depth to each zone. The three most successful algorithms to date have been modified versions of the tomographer's ART (algebraic reconstruction technique). SIRT (simultaneous iterative reconstruction technique),

Field 8—ENGINEERING WORKS

Group 8G-Materials

and BPT (back projection technique). Results were presented to show the ability of the al-gorithms to resolve various-sized simulated anomalies that are analogous to voids and ore bodies. Finally, the results of experimental measurements were presented. (Sanderson-ISWS) W75-10910

CORROSION BY DOMESTIC WATERS, Illinois State Water Survey, Urbana For primary bibliographic entry see Field 5F. W75-11062

LONGER LIFE FOR SUBMERSIBLES. Water Well Journal, Vol 29, No 4, p 60, April,

Descriptors: *Corrosion, *Alkaline materials, *Pitting(Corrosion), *Pumps, Hydraulic equipment, Protection, Corrosion control, Chemical degradation, Water softening, Algae, Bacteria, Acidic water, Submerged, Equipment. Identifiers: *Soda ash, Submersible pump.

Pitting due to organic growth on a pump and corro-sion due to acid well water are two important causes of shorter life for pumps. Pitting occurs when bacteria or algae in well water attach themselves to the metal surface. They create minute electrolytic cells and a voltage differential between the metal under the organism and the water surrounding it. This differential is trans-mitted by metallic ions transferring into solution leaving behind a pit. Chlorination to kill the organisms can solve this problem. Corrosion by acid well water can be detected by sampling the water. Correction of acid water can be accomplished by addition of alkaline substances such as soda ash at the pump. (Bradbeer-NWWA) W75-11259

ELECTRICAL TESTS FOR SUBMERSIBLE PUMPS, R. C. Middleton.

Water Well Journal, Vol 29, No 4, p 61-62, April, 1975. 6 fig.

Descriptors: *Testing procedures, *Electrical equipment, *Resistivity, *Electric currents, Electric motors, Pumps, Water wells, Groundwater, Inspection.
Identifiers: *Submersible pump.

Submersible pump motors are designed to operate within a line-voltage variation limit of approxi-mately plus-or-minus 10 percent. Voltage is suitably measured with a small a-c voltmeter at the control box, as for a single-phase motor, or at the magnetic starter as for a three-phase motor. The test method is shown in a diagram. Difficulties in a submersible pumps can also be caused by excessive current drain. To measure current an a-c ammeter is inserted in series with the line. Current should be measured in each of the three motor lines of a three-phase system, then unequal readings indicate trouble. Insulation resistance can be checked with a high range ohmmeter. Readings of less than 5 million ohms for a new installation indicate a leak in the system. (Bradbeer-NWWA) W75-11260

BASIC CONCEPTS AND PRACTICAL ASPECTS OF CORROSION INVESTIGATION,

Corrosion Control Technologists, Houston, Tex. M. A. Riordan.

Materials Protection and Performance, Vol 12, No 4, p 55-59, April 1973. 7 fig.

Descriptors: *Corrosion, *Oxidation, *Chemical degradation, Investigations, *On-site investiga-tions, On-site data collection, Pipelines, Founda-tions, Well casings, Steel pipes, Water wells, Electrical potential.

Identifiers: IR drop measurements, Half cell method

Four field techniques of corrosion investigation using common electrical measurements have been describd and categorized as to application under various field conditions. They include the IR drop weasurements, the standard half cell method, soil-to-soil potentials, and pipe-to-soil potentials. The development of a fundamental corrosion circuit reference diagram has been reviewed step by step and its practical significance outlined. (Campbell-W75-11271

THE KINETICS OF CRYSTALLIZATION OF

SCALE-FORMING MINERALS, State Univ. of New York, Buffalo. G. H. Nancollas, and M. M. Reddy. Society of Petroleum Engineers Journal, Vol 14, No 2, p 117-126, April, 1974. 8 fig. 1 tab, 32 ref.

Descriptors: *Scaling, *Calcium sulfate, *Calcium carbonate, *Crystal growth, *Growth rates, *Kinetics, Hard water, Activation energy, Electrolytes, Descaling, Groundwater, Wells, Pipes, Phosphates, Water chemistry. Identifiers: *Calcium sulfate, Scale inhibitors, Second order rate law, Phosphonate.

Reviewed is the kinetics of crystal growth of sparingly soluble minerals such as calcium car-bonate, calcium sulfate, and barium sulfate, which frequently cause scaling problems in oil fields. For all three electrolytes, the crystal growth is surface controlled and follows a second-order rate law with an activation energy for the growth process of 10 to 20 kcal mol-1. The growth of calcium sulfate seeded crystal above 100 degrees C demonstrates the importance of characterizing polymorphic transformation processes. polymorphic transformation processes. Phosphonate scale inhibitors show differing modes of inhibition in systems precipitating CaCO3 and CaSO4. (Bradbeer-NWWA) W75-11273

DISSOLVED GASES ARE KEY CORROSION CULPRITS.

Petrotech Ltd., London (England). C. C. Patton.

Oil and Gas Journal, Vol 72, No 29, p 66-69, July 22, 1974. 3 fig, 3 ref.

Descriptors: *Corrosion, *Dissolved oxygen *Electrochemistry, *Hydrogen sulfide, *Carbon dioxide, Flow rate, Aging(Physical), Chemical degradation, Well casings, Well screens, Oxida-tion, Steel, Chemical reactions, Deterioration. Identifiers: *Corrosion cell, Dissolved gases.

Corrosion prevention is particularly important as drill pipe becomes scarcer and more precious. Corrosion theory and the susceptibility of steel and other metals to corrosion are discussed. The effects on corrosion rates of dissolved oxygen, carbon dioxide, and hydrogen sulfide are mentioned as well as the effects of physical variables such as fluid velocity and pressure. (Bradbeer-NWWA) W75-11274

SIMPLE FIELD CHECKS WILL PROVIDE AC-CURATE DST DATA, Halliburton Services, Monahans, Tex.

S. J. Bateman.

World Oil, Vol 178, No 5, p 97-100, April, 1974. 6 fig, 6 ref.

Descriptors: *Pressure, *Testing, *Measurement, *Drilling, Procedure, Deep wells, High pressure, Hydrostatic pressure, On-site investigations, Onsite tests. Identifiers: *Drill stem test data.

Drillstem tests (DST) are an important exploratory tool but, in the past, only 35% of tests run have obtained information adequate for analyses. The importance and methods of testing are stressed and preliminary test chart evaluation procedures are

outlined. The accuracy of the DST is limited by data quality that is assured only by careful testing procedure. (Campbell-NWWA)

SPECIAL ANNULUS FLUID EASES CASING RECOVERY World Oil, Vol 178, No 5, p 117, April, 1974. 2 fig.

Descriptors: *Drilling equipment, *Well casings, *Pipes, *Tubes, *Lubricants, Efficiencies, Water

Identifiers: *Equipment recovery, *Dry wells, Annulus fluid.

An operator recently recovery 6,100 feet of intermediate casing from an unsuccessful wildcat well, three weeks after the pipe was set. Recovery was facilitated by a new annulus fluid which lubricates and protects the pipe until it is pulled. (Bradbeer-NWWA) W75-11282

TESTS SHOW POTASSIUM MUD VERSATILI.

NL Industries, Inc., Houston, Tex. Baroid Div T. C. Mondshine.

Oil and Gas Journal, Vol 72, No 16, p 120-130, April 22, 1974, 8 fig. 4 tab, 8 ref.

Descriptors: *Drilling fluids, *Mud, *Potassium compounds, *Feasibility studies, Stability, Shales, Stabilization, Salts, Surfactants, Oil wells, Water

Identifiers: *Potassium lignite.

A new potassium-based mud system is prepared with potassium chloride or other potassium compounds, and contains a potassium lignite derivative for limiting shale hydration and reducing filtration. A special nonionic surfactant is used for controlling rheology. The system exhibits shale controlling rheology. The system exhibits shade stability, solids tolerance, versatility, and thermal stability. Laboratory and field tests confirm its utility. Preparation of the system is recounted step-by-step. (Bradbeer-NWWA) W75-11284

HOW TO FIND TRANSITION ZONES IN SOFT FORMATIONS.

Continental Oil Co., Houston, Tex. P. E. Pilkington, and W. H. Fertl. World Oil, Vol 180, No 5, p 98-102, ...pril, 1975. 8 fig, 10 ref.

Descriptors: *Drilling, *Pressure, *Measurement, High pressure, Safety, Shallow wells, Drilling fluid, Weight, Groundwater, Water wells. Identifiers: *Formation pressure, *Transition zones of pressure, Soft formations(Geologic), d

Pin-pointing transition zones in soft, shallow formations often in difficult, but when certain drilling variables such as overbalance and hydraulics are monitored and held constant, d exponent techniques can be used successfully. The d exponent is in widespread use as a formation pres-sure detection device. The d exponent is defined, problems in its use are discussed and some alternative means of improving utility of d exponent plots are suggested. (Bradbeer-NWWA) W75-11285

MAKING LOG ANALYSTS OF GEOLOGISTS. For primary bibliographic entry see Field 7C. W75-11288

CASING-SEAT TESTING - WHY AND HOW, For primary bibliographic entry see Field 8F. W75-11291

HOW TO CONDUCT CORROSION TESTS.

J. D. Palmer.

Canadian Chemical Processing, Vol 57, No 8, p 52, 54-55, August, 1973. 3 fig.

Descriptors: *Corrosion, *Methodology.
*Corrosion control, *Testing procedures, Evaluation, Testing, Materials testing, Laboratory tests, Quality control, Sampling, On-site tests, Materi-

Identifiers: *Corrosion tests, Corrosion detection.

Some degree of control over corrosion test conditions must be obtained. In the field, this control may be limited to knowing the operating conditions have not changed appreciably, or have changed in a specific way. Complete control over all material and operating variables may be ob-tained, but may be impractical. Exposure time of tests, preparation of samples, choice of samples, choice of measuring equipment, and sample size may all affect corrosion results. In tests involving an exposure, even the local weather may be a factor. (Bradbeer-NWWA) W75-11292

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING; PART 4: PIT-FALLS IN OVERPRESSURE PREDICTION,

Continental Oil Co., Ponca City, Okla. Production Research Dept.

W. H. Fertl, and D. J. Timko.

World Oil, Vol 175, No 4, p 45-49, September, 1972. 6 fig.

Descriptors: *Drilling, *Pressure, *High Pressure, *Temperature, Evaluation, Salt, Shales, Draw-down, Caprock, Geophysics, Oil, Groundwater. Identifiers: *Formation pressure, Sloughing, Pressure drawdown, Pressure seals, Pressure bridge.

The many factors that affect the use of wireline techniques to determine abnormal pressure environments are described. The proper compensa-tion for these factors and their recognizable characteristics are given to avoid costly misinterpretations. A comprehensive discussion of how caprocks relate to overpressure is included. (See W75-11295 thru W75-11296) (Bradbeer-NWWA) W75-11294

HOW DOWNHOLE TEMPERATURES, PRES-HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING; PART 5: PRE-DICTING HYDROCARBON ENVIRONMENTS WITH WIRELINE DATA, Continental Oil Co., Houston, Tex. Production

Engineering Services

D. J. Timko, and W. H. Fertl. World Oil, Vol 175, No 5, p 73-80, 88, October, 1972. 6 fig, 54 ref.

Descriptors: *Drilling, *Pressure, *Temperature, *High pressure, *Spatial distribution, Distribution patterns, Oil, Gas, Hydrocarbons, Statistical methods, Correlation analysis, Groundwater, Exploration, Regional analysis, Oil industry, Deep

Identifiers: Oil exploration

Methods of predicting the presence of hydrocarbons in a geographical area of investigation are discussed. Methods involve comparing log derived reservoir data to statistical properties of hydrocar-bon environments. The distribution of terrestrial heat, clay diagenesis, and the sand-shale ratio are included in an attempt to correlate such statistics with oil and gas occurrence. (See also W75-11294) (Bradbeer-NWWA) W75-11295

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING; PART 6: COR-RELATING GEOPRESSURE GRADIENTS WITH HYDROCARBON ACCUMULATIONS, Continental Oil Co., Houston, Tex. Production Engineering Services. Engineering Services.

D. J. Timko, and W. H. Fertl. World Oil, Vol 175, No 6, p 79-82, November, 1972. 6 fig, 1 tab, 19 ref.

Descriptors: *Drilling, *Pressure, *Temperature, *Spatial distribution, *Oil, *Gas, *Hydrocarbons, Deep wells, Distribution patterns, Oil industry, Correlation analysis. Identifiers: *Pressure-depth gradient.

Geopressure gradients are correlated with the spatial and depth distribution of hydrocarbon accu-mulations. Temperature-pressure-depth relationships and abnormal pressure conditions can be re-lated to gas and oil fields, even size of reservoirs. In addition, some reasons why gas occurrence predominates at deeper depths are suggested. (See also W75-11294) (Bradbeer-NWWA)

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING; PART 7: THE SHALE RESISTIVITY RATIO - A VALUABLE TOOL FOR MAKING ECONOMIC DRILLING

Continental Oil Co., Houston, Tex. Production Engineering Services

D. J. Timko, and W. H. Fertl. World Oil, Vol 175, No 7, p 59-63, December, 1972. 6 fig, 6 ref.

Descriptors: *Drilling, *Shale, *Resistivity, *High pressure, *Oil, Gas, Exploration, Geophysics, Oil industry, Oil wells, Deep wells, Statistical analysis, Groundwater. Identifiers: *Shale resistivity ratio

The shale resistivity ratio profile for an area such as the Gulf Coast, or similar geologic basins with sand-shale sequences, can save millions of drilling dollars. The profile can indicate whether it is possible for commercial production to exist below the depth to which the well has already been logged, and whether it is economically attrative to continue a borehole below a given depth. Basic guidelines for use of the method and some selected field examples of its application are presented. (See also W75-11294) (Campbell-NWWA) W75-11297

HOW DOWNHOLE TEMPERATURES, PRES-SURES AFFECT DRILLING; PART 8: NEEDLESS SPENDING OF DRILLING AND EX-PLORATION MONEY CAN BE PREDICTED-AND PREVENTED,

Continental Oil Co., Houston, Tex. Production

Engineering Services.
D. J. Timko, and W. H. Fertl.

World Oil, Vol 176, No 1, p 45-48, January, 1973. 7

Descriptors: *Drilling, *Exploration, *Oil, *Gas, *High pressure, Electrical well logging, Well data, Deep wells, Ground water. Identifiers: *High pressure gradients

Proper analysis of log-calculated temperatures and pressures can save millions of dollars by prevent-ing unnecessary drilling and setting of additional casing in unfavorable hydrocarbon environments. How to predict whether commercial production can exist below a given depth in a drilling well is described and - as an example of the analysis method- why certain offshore Texas acreage is an extremely poor hydrocarbon prospect is ex-plained. (See also W75-11294) (Campbell-NWWA) W75-11298

81. Fisheries Engineering

LIMNOLOGY OF DESERT PONDS, Arizona Univ., Tucson. Dept. of Biological For primary bibliographic entry see Field 2H. W75-10880

SOME LIMNOLOGICAL CHARACTERISTICS OF ARIVACA LAKE IN SOUTHERN ARIZONA, Arizona Univ., Tucson. For primary bibliographic entry see Field 2H. W75-10891

SURVIVAL AND GROWTH RATE OF CHAN-NEL CATFISH AS A FUNCTION OF DIS-SOLVED-OXYGEN CONCENTRATION, Arkansas Univ., Little Rock. Dept. of Electronics and Instrumentation. For primary bibliographic entry see Field 5C. W75-11051

UNISEX STUDIES ON THE WHITE AMUR, Bureau of Sport Fisheries and Wildlife, Stuttgart, Ark. Fish Farming Experiment Station. For primary bibliographic entry see Field 5C. W75-11205

THE EFFECTS OF THE FORMATION OF LAKE KAINJI (NIGERIA) UPON THE IN-DIGENOUS FISH POPULATION, Ife Univ. (Nigeria). Kainji Dam Research Project. For primary bibliographic entry see Field 5C W75-11223

EXPERIMENTALLY INCREASED FISH STOCK IN THE POND TYPE LAKE WARNIAK. IV. FEEDING OF INTRODUCED AND AUTOCHTHONOUS NON-PREDATORY FISH, Warsaw Univ. (Poland). Dept. of Hydrobiology. For primary bibliographic entry see Field 5C.

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

DEVELOPMENT OF A BIBLIOGRAPHIC INFORMATION SYSTEM FOR WATER YIELD IMPROVEMENT PRACTICES,

Arizona Univ., Tucson. School of Renewable Natural Resources

L. M. White, D. B. Thorud, and P. F. Ffolliott. Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-244 696, \$3.25 in paper copy, \$2.25 in microfiche. Comple-tion Report, August 1975. 6 p, 9 ref. OWRT A-042-ARIZ(9). 14-31-0001-3803.

Descriptors: *Information retrieval, Computers, Bibliographies, "Water yield improvement, "Watershed management, "Arizona, Southwest U.S., Water yield, Forest management, Land management, Water sources, Vegetation effects, Water quality.

Identifiers: Bibliographic searches, Information systems, Literature searches.

Development of the Watershed Management In-Development of the watershed management in-formation System (WAMIS) began in 1972. WAMIS is designed to serve a variety of users who are interested in water and natural resource research in Arizona. WAMIS is a computerized bibliographic reference retrieval system which provides literature searches for users, in the form of individualized computer printouts of citations and abstracts, based upon a user's special in-terests. The literature covered in WAMIS includes effects of land management practices and vegetation management on water and other related resources, such as forage production, wildlife habitat, timber production, and recreational use. Research done in Arizona has been emphasized. General procedures used in banking and retrieval are described. Types of search requests have varied, including topics such as wildlife use of ponderosa pine forests, environmental and vegetation effects on evapotranspiration, hydrologic

Field 10—SCIENTIFIC AND TECHNICAL INFORMATION

Group 10B—Reference and Retrieval

modeling, Arizona water quality data, the effect of timber cutting practices on runoff, and revegetation of treated pinyon-juniper vegetation. W75-11050

10C. Secondary Publication And Distribution

THE AWARENESS OF THE RELEVANT WATER RESOURCES LITERATURE BY THE PERSONNEL OF THE WISCONSIN DEPARTMENT OF NATURAL RESOURCES, Wisconsin Univ., Madison. Library School. R. D. Walker, G. J. Zuck, R. E. Durrance, and J. R. Luedtke.

Luedtke.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 500, \$4.75 in paper copy, \$2.25 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report WIS WRC 75-09, August 1975. 81 p, 23 ref, charts, append. OWRT B-083-WIS(2). 14-31-0001-4138.

Descriptors: *Documentation, *Publications, *Information exchange, Technical writing, Wisconsin, Personnel.
Identifiers: *Wisconsin Department of Natural

Resources, *Information transfer.

This study is the second part of the first phase of a more comprehensive research study to examine the transfer of information in the area of water resources. It deals with the physical charac-teristics, the sources of financial support, publishing sources, format, availability, and subject coning sources, format, availability, and subject con-centration of the literature (publications) designated to be relevant by a sample of water resources personnel employed by the Wisconsin Department of Natural Resources. Journal title dispersion is described for the applicable literature. Awareness or unawareness of the relevant literature is of primary concern as is a determina-tion of the difference between the known and the unknown literature. (See also W75-07996) W75-10899

HEAVY METALS AND OTHER TRACE ELE-MENTS,

Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 5B. W75-10934

NON-RENEWABLE,

RESOURCES, Leicester Univ (England). Public Sector Economics Research Centre.
For primary bibliographic entry see Field 6B. W75-11253

NON-ENERGY

THE TOXICITY OF DRILLING FLUID COM-PONENTS TO AQUATIC BIOLOGICAL SYSTEMS, A LITERATURE REVIEW, Fisheries and Marine Service, Winnipeg Fisheries and Marine Service, (Manitoba). For primary bibliographic entry see Field 5C. W75-11266

10D. Specialized Information Center Services

DEVELOPMENT OF A BIBLIOGRAPHIC INFORMATION SYSTEM FOR WATER YIELD IMPROVEMENT PRACTICES, Arizona Univ., Tucson. School of Renewable Natural Resources. For primary bibliographic entry see Field 10B W75-11050

10E. Translations

TRANSLATIONS ON ENVIRONMENTAL QUALITY, NO. 33.

Joint Publications Research Service, Arlington, For primary bibliographic entry see Field 05G. W75-11246

10F. Preparation Of Reviews

HEAVY METALS AND OTHER TRACE ELE-Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 05B. W75-10934

WATER AND WASTEWATER DISINFECTION WITH OZONE: A CRITICAL REVIEW, Cincinnati Univ., Ohio. For primary bibliographic entry see Field 05D. W75-10956

AND COMPUTER SYSTEMS WATER RESOURCES, Polytechnic Institute of New York, Brooklyn; and Illinois Univ., Chicago. For primary bibliographic entry see Field 06A. W75-11174

THE TOXICITY OF DRILLING FLUID COM-PONENTS TO AQUATIC BIOLOGICAL SYSTEMS, A LITERATURE REVIEW, and Marine Service, (Manitoba) For primary bibliographic entry see Field 05C. W75-11266

CONSIDERATIONS FOR PREPARATION OF OPERATION AND MAINTENANCE MANUALS, Environmental Protection Agency, Washington, D.C. Office of Water Program Operations. For primary bibliographic entry see Field 05D. W75-11317

SUBJECT INDEX

	,	
2-4-5-T Occurrence of 2, 4, 5-T and Picloram in Sur-	ADAPTATION Adaptation of Copepod Populations to Thermal	AESTIVATION Seasonal Abundance and Diversity of Benthos
face Runoff Water in the Blacklands of Texas,	Stress,	in a Southern Illinois, USA Swamp,
W75-10895 5B	W75-11046 5C	W75-11312 2H
2-4-D	ADMINISTRATION	AFRICA
Field Tests of Slow-Release Herbicides, W75-11193 5G	The Law of Water Allocation in Kentucky, W75-10898 6E	International Development Strategies for the Sahel.
1 1 M 1 C 1 1 1 1 C 2 C 1 1 1		W75-10861 4A
Aquatic Plant Control on Lake Corpus Christi, W75-11194 5G	Water Resources, W75-11003 5G	The Effects of the Formation of Lake Kainji
Di tada di Patta di Phana di Atti		(Nigeria) Upon the Indigenous Fish Population,
Dissipation of Residues of Phenoxy Herbicides Applied for Water Milfoil Control in Large	ADMINISTRATIVE AGENCIES The Water Industry in Transition,	W75-11223 5C
Reservoirs, W75-11198 5B	W75-11252 3E	AGASICLES HYGROPHILA
W/3-11196 3B	A PASSAGER A TIME DECARAGE	Biological Control of Alligator Weed, 1959-
ABATE	ADMINISTRATIVE DECISIONS Human Obstacles to the Control of the	1972,
The Effects of Experimental Blackfly (Diptera: Simuliidae) Larviciding with Abate, Dursban,	Hydrological Cycle for the Benefit of Man,	W75-11202 5G
and Methoxychlor on Stream Invertebrates,	W75-10866 2A	AGRICULTURE
W75-11157 5C	AERATION	Estimation of Safe Periods for Crop Planning
A DD A CLON	Concurrent Nitrification-Denitrification at the	Under Dryland Agriculture, W75-10926 3F
ABRASION Measurement of Cobble Abrasion in Natural	Sediment-Water Interface as a Mechanism for	W75-10920
Streams,	Nitrogen Losses from Lakes,	An Implicit Approach to Pricing Agricultural
W75-10881 2J	W75-10902 5C	Water Transfers to Urban Uses,
	First Stage of the World's Largest Pure Oxygen	W75-11178 4A
ABSCISIC ACID	Sewage Plant to Undergo Test.	AHOSKIE CREEK (NC)
The Role of Endogenous Abscisic Acid in the Response of Plants to Stress,	W75-10960 5D	Predicting Recessions Through Convolution,
W75-11319 3F		W75-10917 2E
	Aeration Devices: Basic Theory,	
ABSORPTION	W75-10971 5D	AIR DRILLING
Absorption and Elimination of Photodieldrin by	Adjudicating Tenders for Aeration Devices:	Unconventional Air Drilling Reduces Well Costs.
Daphnia and Goldfish, W75-11085 5B	Best Value and Reliability,	W75-11270 8C
W/3-11063	W75-10972 5D	77.2 112.0
ACTIVATED CARBON	Innovative Process Treats Wastewater,	AIR POLLUTION
Carbon Regeneration by Wet Air Oxidation, W75-10988 5D	W75-10975 5D	Evidence of Atmospheric Transport of Ozone into Urban Areas,
Activated Carbon in the Water Treatment	Aeration Devices: The Manufacturer's View-	W75-11169 5A
Plant,	point,	Economic Analysis of Effluent Guidelines. Fer-
W75-10992 5D	W75-11121 5D	roalloys Industry.
Anti-ted Codes Advantis Technisms for	AERATION DEVICES	W75-11250 5G
Activated Carbon Adsorption Technique for Third Stage Sewage Water Treatment, (In	Adjudicating Tenders for Aeration Devices:	ALASKA
Japanese),	Best Value and Reliability,	How BP Alaska Cements Through Permafrost.
W75-11108 5D	W75-10972 5D	W75-11278 8F
ACTIVATED SLUDGE	AERATORS	AT COMOL S
Preserving Activated Sludge,	Aeration by Means of Blast NozzleA Possi-	ALCOHOLS An Investigation of Glycolate Excretion in Two
W75-10962 5D	bility for the Aeration of Biological Waste	Species of Blue-Green Algae,
Settlement and Sludge Return in Activated-	Water Treatment Plants (Die Strahlduesen- begasungeine Moeglichkeit zur Belueftung	W75-11230 SC
Sludge Type Package Plants,	biologischer Klaeranlagen),	ALGAE
W75-10973 5D	W75-11124 5D	Nitrogen Removal by Catalyst-Aided Break-
Nitrogen Removal in the Operation of the	APRIAL BHOTOCRABUS	point Chlorination,
Mililani Sewage Treatment Plant,	AERIAL PHOTOGRAPHY The Utilization of Sun-Glint in a Study of Lake	W75-10965 5D
W75-11041 5D	Dynamics,	Wastewater Treatment Using Algae and Ar-
Huntingdon Research Centre Pasveer Oxida-	W75-11239 5A	temia,
tion PlantSix Years On,	AND ORGO COMPANIONS	W75-10967 5D
W75-11115 5D	AEROBIC CONDITIONS Innovative Process Treats Wastewater,	Beletions Between Alex Develotions and the
Aeration by Means of Blast NozzleA Possi-	W75-10975 5D	Relations Between Algal Populations and the pH of Their Media,
bility for the Aeration of Biological Waste		W75-11028 5C
Water Treatment Plants (Die Strahlduesen-	AEROBIC TREATMENT	
begasung-eine Moeglichkeit zur Belueftung	Aerobic Lagoon Waste Treatment System and	Biochrome Analysis as a Method for Assessing
biologischer Klaeranlagen),	Method, W75-11069 5D	Phytoplankton Dynamics, Phase II, W75-11052 5C
W75-11124 5D		
Interactions of Heavy Metals in the Activated	Mill Experience in the Treatment of Mechani-	Influence of Oil on Nucleic Acids of Algae,
Sludge Process,	cal Pulping Effluent, W75-11332 5D	W75-11080 5C
W75-11173 5D	W75-11332 5D	Concentration and Genera of Algae in Selected
Papermaking Complex at Dunaujvaros	AESTHETICS	Illinois Streams, 1971-1973,
(Hungary) Preserving the Danube (Au com-	Water Application Practices and Landscape At-	W75-11165 5A
plexe papetier de Dunaujvaros preserver le	tributes Associated with Residential Water	Alone in Boltimore's Becoming
Danube), W75-11333 5D	Consumption, W75-11059 3D	Algae in Baltimore's Reservoirs, W75-11221 50

The Growth of Some Epiphytic Algae in a Lake	ALUM	Advanced Techniques in the Mathematical
Receiving Thermal Effluent, W75-11225 SC	Optimum Values for Operational Variables in Turbidity Removal,	Modeling of Water-Distribution Systems, W75-11183
	W75-11110 5D	
A Contribution to the Biology of Nitella Hookeri A. BR. in the Rotorua Lakes, New	AMERICAN OYSTER EGGS	Application of the Manometric Technique in the Study of Sediment Oxygen Depletion,
Zealand. II. Organic Nutrients and Physical	Effects of Ozone-Treated Seawater on the	W75-11222 5C
Factors, W75-11235 5C	Spawned, Fertilized, Meiotic, and Cleaving Eggs of the Commercial American Oyster,	Extraction and Analytical Techniques for Pesti-
	W75-11256 5C	cides in Soil, Sediment, and Water,
ALGAE COMPOSITION Concentration and Genera of Algae in Selected		W75-11236 5A
Illinois Streams, 1971-1973,	AMMONIA Nitrogen Removal by Catalyst-Aided Break-	Making Log Analysts of Geologists.
W75-11165 5A	point Chlorination,	W75-11288 7C
ALGAE DENSITY	W75-10965 5D	Detection of Change in Sequences of
Concentration and Genera of Algae in Selected	The Effects of Free Ammonia and Free	Hydrologic Data, W75-11302 7C
Illinois Streams, 1971-1973, W75-11165 5A	Nitrous Acid on the Nitrification Process, W75-11101 5D	Interference of Mercury(II) in the Colorimetric
	W75-11101 5D	Determination of Inorganic Phosphate in
ALGAE TYPE Concentration and Genera of Algae in Selected	Ammonia Excretion by Zooplankton and its	Water,
Illinois Streams, 1971-1973,	Significance to Primary Productivity During Summer,	W75-11340 5A
W75-11165 5A	W75-11187 5C	Modification of the Iodimetric Titration
ALGAL CONTROL	AMMONIA EXCRETION	Method for the Determination of Bromide and Its Application to Mixed Domestic-Industrial
Electrolytic Control of Algae,	Ammonia Excretion by Zooplankton and its	Waste Effluents,
W75-11228 5F	Significance to Primary Productivity During	W75-11341 5A
Algae Control in Northwest Reservoirs,	Summer, W75-11187 5C	ANIMAL PHYSIOLOGY
W75-11231 5G		Mercury Content of Whales, (In Japanese),
ALGAL REMOVAL	AMMONIUM-NITROGEN Concurrent Nitrification-Denitrification at the	W75-11029 5B
Algae Removal Using Dissolved Air Flotation, W75-10978	Sediment-Water Interface as a Mechanism for	The Effects of Oil Dispersants on the Cell in Fertilization and Development,
W75-10978 5D	Nitrogen Losses from Lakes,	W75-11091 5C
ALGORITHMS	W75-10902 5C	ANION EXCHANGE
Computer Algorithms Useful for Determining a Subsurface Electrical Profile Via High	AMOEBAE POPULATION DENSITY	Chromatographic Determination of Phenols in
Frequency Probing,	Pathogenic Free-Living Amoebae in Arkansas Recreational Waters,	Water,
W75-10910 8G	W75-11053 5A	W75-11344 5A
ALKALI SACATON	АМРНІРОДА	ANTITRANSPIRANTS
Establishing Alkali Sacaton on Harsh Sites in the Southwest,	Factors Influencing Acute Toxicity Estimates	Effects of Antitranspirants on Yield of Grain Sorghum Under Limited Irrigation,
W75-10882 4A	of Hydrogen Sulfide to Freshwater Inver- tebrates,	W75-10858 3F
ALKALINE MATERIALS	W75-11027 5C	APPLICATION EQUIPMENT
Longer Life for Submersibles.	ANABAENA	Operations Platforms,
W75-11259 8G	An Investigation of Glycolate Excretion in Two	W75-11210 4A
ALKALINE WATER	Species of Blue-Green Algae,	APPLICATION METHODS Scheduling and Application Rates of Irrigation
System for Softening and Dealkalizing Water by Electrodialysis,	W75-11230 5C	in a Humid Climate,
W75-11065 5F	ANAEROBIC ACIDOGENESIS	W75-11048 3F
ALLIGATORWEED	Anaerobic Acidogenesis of Wastewater Sludge, W75-10976 5D	Nozzle Hydraulics in the Trickle Irrigation
Biological Control of Alligator Weed, 1959-		SystemRelation Between Water Temperature and Nozzle Flow Rate (In Japanese),
1972,	ANAEROBIC DIGESTION Anaerobic Acidogenesis of Wastewater Sludge,	W75-11096 3F
W75-11202 5G	W75-10976 5D	Practical Application of Surface Fixed-System
ALLUVIAL AQUIFIERS	Nitrogen Removal in the Operation of the	for Multi-Purpose Sprinkler Irrigation Uses, (In
Hydrogeology and Water Resources of Middle Kirkland Creek Basin, Yavapai County,	Mililani Sewage Treatment Plant,	Japanese),
Arizona,	W75-11041 5D	W75-11097 3F
W75-10872 4B	ANALOG MODELS	Field Tests of Slow-Release Herbicides, W75-11193 5G
ALLUVIAL CHANNELS	Application of Electrical Analogy to Draw	
Stochastic Analysis of Particle Movement Over a Dune Bed,	Flow Nets for Sudden Drawdown Conditions in Earth Dams,	AQUATIC ENVIRONMENT Some Limnological Characteristics of Arivaca
W75-10942 2J	W75-11143 8B	Lake in Southern Arizona,
ALTERNATIVE PLANNING	ANALYTICAL TECHNIQUES	W75-10891 2H
Improved Design of Distribution Networks by	Advances in the Detection of Water Pollutants.	Herbicide Chemicals and Their Effect on the
Minimum Route,		
W75-11175	W75-10995 5A	Aquatic Environment, W75-11211 5C
W75-11175 4A	W75-10995 5A Measures of Biodegradability and Refractory	W75-11211 5C
The Louisiana Environmental Management	W75-10995 5A Measures of Biodegradability and Refractory Organics in Wastewaters: (Analysis, Interpreta-	W75-11211 5C AQUATIC LIFE
	W75-10995 5A Measures of Biodegradability and Refractory Organics in Wastewaters: (Analysis, Interpreta-	W75-11211 5C

AQUATIC PLANTS	AQUICULTURE	ARIVACA LAKE (ARIZ)
The Aquatic Weed Problem. 1. Identification, W75-11220	Status of Waste Heat Utilization and Dual-Pur-	Some Limnological Characteristics of Arivaca Lake in Southern Arizona,
	W75-11251 3E	W75-10891 2H
AQUATIC WEED CONTROL		
Comparison of Uredo Eichhorniae, the Water		ARIZONA
hyacinth Rust, and Uromyces Pontederiae, W75-11092		Differential Release of Water from Arizona Snowpacks,
O the Olera Server	Arizona,	W75-10860 2C
Operation Clean Sweep,	W75-10872 4B	
W75-11192 5C		Barrenness of Desert Pavement in Yuma Coun-
Field Tests of Slow-Release Herbicides,	Ground Water in the Corvallis-Albany Area,	ty, Arizona,
W75-11193 50	Central Willamette Valley, Oregon, W75-10940 2F	W75-10868 2G
Aquatic Plant Control on Lake Corpus Christi,	Recharge Areas of the Floridan Aquifer in	The Influence of Rainfall on the Reproduction
W75-11194 5C	Seminole County and Vicinity, Florida,	of Sonoran Desert Lagomorphs, W75-10871 4A
Aquatic Plant Research and Control in Florida,	W75-10944 7C	
W75-11195 4A	AQUIFER MANAGEMENT	Hydrogeology and Water Resources of Middle
	Management of Retardation of Salt Water In-	Kirkland Creek Basin, Yavapai County,
Criteria for Herbicide Evaluation,	trusion in Coastal Aquifers,	Arizona,
W75-11196 50	W75-11058 2F	W75-10872 4B
m		Consequent Variations in the Infiltration Pote of a
Dissipation of Residues of Phenoxy Herbicide		Seasonal Variations in the Infiltration Rate of a
Applied for Water Milfoil Control in Large	Hydrogeology and Water Resources of Middle	Whitehouse Soil in Southern Arizona,
Reservoirs,	Kirkland Creek Basin Vayanai County	W75-10873 2G
W75-11198 51	Arizona,	Limnology of Desert Ponds,
Chemical Control of Egeria Densa,	W75-10872 4B	W75-10880 2H
W75-11199 50		W 73-10000 211
W/3-11122	Horizontal Groundwater Collectors, Hydraulics	Measurement of Cobble Abrasion in Natural
Field Testing of Aquatic Herbicides for Control	and Design,	Streams,
of Egeria Densa,	W75-10998 8B	W75-10881 2J
W75-11200 50		
	Horizontal Groundwater Collectors, 'Canada's	Phytophthora Species in Arizona: Its Occur-
Aquatic Plant Control Using Herbicides in	Largest Water Well', W75-10999 8B	rence in Recycled Irrigation water,
Large Potable Water Supply,		W75-10883 5A
W75-11201 50	Induced Infiltration Supply System Among Big-	
Biological Control of Allianter Wood 1950		Factors Affecting Erosion in a Semi-Arid
Biological Control of Alligator Weed, 1959 1972,	W75-11010 5F	Watershed,
W75-11202 50		W75-10884 2J
11/3-11202	Deprivation Contribution and Interference Ef-	Effects of Pinyon-Juniper Removal on Natural
Biological Control of Eurasian Water Milfoil,	fects of Multiple Wells in a Common Aquifer,	Resource Products and Uses in Arizona,
W75-11203 44	W75-11142 4B	W75-10886 3B
	ADID CLIMATES	W 75-10000
Integrated Controls on Noxious Aquatic Plants		Some Limnological Characteristics of Arivaca
W75-11204 50	Punta Cirio, Sonora, Mexico.	Lake in Southern Arizona,
Unisex Studies on the White Amur,	W75-10862 2I	W75-10891 2H
W75-11205 56		
W75-11203	Shrub Transplanting for Watershed Manage-	An Assessment of Snowpack Depletion-Sur-
Utilization of Phytopathogens as Biocontrol	ment and Range Improvement in Iran,	face Runoff Relationships on Forested
for Aquatic Weeds,	W75-10870 ' 4D	Watersheds,
W75-11206 50		W75-11049 4A
	Improving Productivity in Low Rainfall Areas,	Deliner of a Dillion bir Life of
Aquatic Weed Field Test Program Using a CO		Development of a Bibliographic Information
Electric Discharge Convection Laser,	W75-11099 3F	System for Water Yield Improvement Prac- tices,
W75-11208 52	ARID LANDS	W75-11050 10B
CO2 Laser Effects on Water Hyacinth,	Barrenness of Desert Pavement in Yuma Coun-	W75-11050
W75-11209 50		ARKANSAS
	W75-10868 2G	Biochrome Analysis as a Method for Assessing
Operations Platforms,		Phytoplankton Dynamics, Phase II,
W75-11210 4	Management of Southwestern Desert Soils,	W75-11052 5C
Halita Chair and a reconstruction	W75-10877 2G	
Herbicide Chemicals and Their Effect on th		Pathogenic Free-Living Amoebae in Arkansas
Aquatic Environment, W75-11211 56	Soils of the Desert Southwest, W75-10878 2G	Recreational Waters,
W75-11211 56	W/3-106/6	W75-11053 5A
Registration of Aquatic Herbicides,	Guidelines for Revegetation and Stabilization	Unisex Studies on the White Amur.
W75-11212 4.		The state of the s
	W75-11100 4D	W75-11205 5C
Water Hyacinth Research in Puerto Rico,		ARSENIC COMPOUNDS
W75-11215 50		The Geochemical Cycle of Arsenic in Lake
Water Level Manipulation: A Tool for Asset	W75-11303 2A	Washington and its Relation to Other Elements,
Water Level Manipulation: A Tool for Aquati	Some Observations on Rainfall in Western	W75-10922 5B
Weed Control, W75-11216 4.		30
4.0-1110	W75-11304 2B	ARTEMIA
AQUATIC WEEDS		Wastewater Treatment Using Algae and Ar-
The Aquatic Weed Problem. 1. Identification,	Australian Arid Zone Streangauging,	temia,
	1 W75-11307 2E	W75-10967 5D

SUBJECT INDEX

ARTESIAN AQUIFERS

ARTESIAN AQUIFERS Management of Retardation of Salt Water In-	AVAILABLE WATER-HOLDING CAPACITIES Available Water-Holding Capacities of Soils in	BED LOAD Measurement of Cobble Abrasion in Natural
trusion in Coastal Aquifers,	Southern Idaho,	Streams,
W75-11058 2F	W75-11140 2G	W75-10881 2J
Ground Water Depletion and Subsidence	AVERAGE FLOW	BEDROCK
Problems in Taipei Basin,	Estimated Mean-Monthly and Annual Runoff	Contour Map of the Bedrock Surface, New
W75-11262 4B	at Selected Sites in the Pojoaque River	Britain Quadrangle, Connecticut,
ARTIFICIAL LAKES	Drainage Basin, Santa Fe County, New Mex-	W75-10950 7C
Some Limnological Characteristics of Arivaca	ico,	Map Showing Depth to Bedrock, Worthington
Lake in Southern Arizona,	W75-10943 2E	Quadrangle, Massachusetts,
W75-10891 2H	AVRA VALLEY (ARIZ)	W75-10951 7C
ARTIFICIAL RECHARGE	The Influence of Rainfall on the Reproduction	
Management of Retardation of Salt Water In-	of Sonoran Desert Lagomorphs,	Map Showing Depth to Bedrock, Greenfield
trusion in Coastal Aquifers,	W75-10871 4A	Quadrangle, Massachusetts, W75-10952 7C
W75-11058 2F	BACK RIVER (MD)	70
ATLANTIC OCEAN	Behavior of Mn, Fe, Cu, Zn, Cd and Pb	Map Showing Depth to Bedrock, Chester
Near-Bottom Chemistry in the Eastern Pacific	Discharged from a Wastewater Treatment Plant	Quadrangle, Massachusetts,
and North Atlantic Oceans,	into an Estuarine Environment,	W75-10953 7C
W75-10923 2K	W75-11160 5B	Map Showing Depth to Bedrock, Mount Car-
AUSTRALIA	BA CORPORA	mel Quandrangle, Connecticut,
The Early Vegetative Growth of Two Annual	BACTERIA Bouleties Duramies of Protogos in Wester	W75-10954 7C
Pasture Grasses (Hordeum Leporinum Link	Population Dynamics of Protozoa in Waste- water,	BEDROCK SURFACE MAPS
and Lolium Rigidum Gaud.),	W75-10957 5D	Contour Map of the Bedrock Surface, New
W75-10876 3F		Britain Quadrangle, Connecticut,
Water Consumption and Water Turnover of	Biological Control: Isolation and Bacterial Ox-	W75-10950 7C
Sheep Grazing Semiarid Pasture Communities	idation of the Taste-and-Odor Compound	
in New South Wales,	Geosmin, W75-11013 5F	BEECH Vegetation, Soil, and Climate on the Green
W75-10888 3F	W 73-11013	Mountains of Vermont,
The Influence of Density and Nitrogen on the	BALANCE OF NATURE	W75-11021 2I
Outcome of Competition Between Two Annual	An Analysis of the Motor-Row Conversion	
Pasture Grasses (Hordeum Leporinum Link	Issue of Colorado River Float Trips,	BENTHIC FAUNA
and Lolium Rigidum Gaud.), W75-10889 3F	W75-10867 6B	Weyl's Theory of Glaciation Supported by Isotopic Study of Norwegian Core K 11,
	BALTIMORE (MD)	W75-11153
Problems of Liquid Waste Disposal,	Algae in Baltimore's Reservoirs,	
W75-11112 5G	W75-11221 5C	Seasonal Abundance and Diversity of Benthos
Hydrologic Investigation and Design of Urban	BARIUM SULFATE	in a Southern Illinois, USA Swamp,
Stormwater Drainage Systems,	Acute Toxicity of Petrochemical Drilling Fluids	W75-11312 2H
W75-11141 4A	Components and Wastes to Fish,	BENTHOS
The Measurement and Estimation of Lake	W75-11265 5C	Species Diversity of Benthic Macroin-Ver-
Evaporation from Four Australian Water	B. BRIER ICI AND	tebrates and Limnological Conditions in a 1st
Storages,	BARRIER ISLANDS Matagorda Island, Texas: The Evolution of a	Order Mountain Stream, W75-10918 21
W75-11300 2D	Gulf Coast Barrier Complex,	1173-10710
Multilag Markov Models for Eastern Australian	W75-11144 2L	Seasonal Abundance and Diversity of Benthos
Streams,		in a Southern Illinois, USA Swamp,
W75-11301 2E	BASALTS	W75-11312 2H
Generation of Arid Zone Rainfall and Runoff,	Hydrogeology and Water Resources of Middle	BIBLIOGRAPHIES
W75-11303 2A	Kirkland Creek Basin, Yavapai County, Arizona,	Development of a Bibliographic Information
Some Observations on Rainfall in Western	W75-10872 4B	System for Water Yield Improvement Prac-
New South Wales.		tices, W75-11050 10B
W75-11304 2B	BASE FLOW	W 75-11030
De la Diades al Desales de	Predicting Recessions Through Convolution, W75-10917 2E	Computer Systems and Water Resources,
Droughts, Distributions and Dependence: An Analysis of Some Synthetic Data Generation	W75-10917 2E	W75-11174 6A
Methods,	BASIC DATA COLLECTIONS	Extraction and Analytical Techniques for Pesti-
W75-11305 2E	Temperatures of Kansas Streams,	cides in Soil, Sediment, and Water,
Australian Arid Zone Streangauging,	W75-10933 2E	W75-11236 5A
W75-11307 2E	The Minor and Trace Elements, Gas, and	Non-Renewable, Non-Energy Resources,
	Isotope Compositions of the Principal Hot	W75-11253 6B
Variability, Persistence and Yield of Australian	Springs of Nevada and Oregon,	77.5 112.5
Streams, W75-11308 2E	W75-10937 2K	The Toxicity of Drilling Fluid Components to
	BEACH EROSION	Aquatic Biological Systems, A Literature
Aspects of Rainfall Measurement in a New En-	Beach Erosion Control Structure,	Review, W75-11266 5C
gland Location, W75-11309 · 2B	W75-11075 8A	
		BIOACCUMULATION
AVAILABLE WATER	BEANS The Pole of Endosenous Abscisic Acid in the	Mercury Contents in Biologically Preserved
Available Water-Holding Capacities of Soils in Southern Idaho,	The Role of Endogenous Abscisic Acid in the Response of Plants to Stress,	Specimens of Menuke (Sebastes Baramenuke and S. Flammeus).
W75-11140 2G	W75-11319 3F	W75-11078 5A

Uptake of Cadmium, Zinc, Copper, Lead and	BIOCONTROL	Chemical-Biological Treatment With Biological
Chromium in the Pacific Oyster, Crassostrea	Biological Control: Isolation and Bacterial Ox-	Filters,
Gigas, Grown in the Tamar River, Tasmania,	idation of the Taste-and-Odor Compound	W75-11123 5D
W75-11086 5B	Geosmin, W75-11013 SF	Mill Experience in the Treatment of Mechani-
Studies on the Inorganic Components of	W75-11013 5F	cal Pulping Effluent.
Marine Animals-III, on the Contents of Cadmi-	Comparison of Uredo Eichhorniae, the Water-	W75-11332 5D
um, Zinc, Copper, Lead and Iron in Muscle	hyacinth Rust, and Uromyces Pontederiae,	
and Viscera of Marine Animals Captured in the	W75-11092 5G	BIOMASS
West Sea Area of Kyushu, (In Japanese).		Seasonal Variation in Composition, Plant
W75-11087 5C	Biological Control of Alligator Weed, 1959-	Biomass, and Net Primary Productivity of a
W15-1100	1972,	Tropical Grassland at Kurukshetra, India,
BIOASSAY	W75-11202 5G	W75-11006 21
Toxaphene Effects on Growth and Bone Com-	Did it is a second of the second	Seasonal Abundance of Crustacean Zooplank-
position of Fathead Minnows, Pimephales	Biological Control of Eurasian Water Milfoil,	ton and Net Plankton Biomass of Lakes Huron,
Promelas,	W75-11203 4A	Erie, and Ontario,
W75-11026 5C	Utilization of Phytopathogens as Biocontrols	W75-11238 5C
	for Aquatic Weeds.	DIONES.
Factors Influencing Acute Toxicity Estimates	W75-11206 5G	BIOMES
of Hydrogen Sulfide to Freshwater Inver-		Freshwater Ecosystem Research in Water
tebrates,	Water Hyacinth Research in Puerto Rico,	Quality Management,
W75-11027 5C	W75-11215 5G	W75-11012 6G
Impact of Thermal Effluent from Steam-Elec-		BIOSPHERE
tric Station on a Marshland Nursery Area dur-	BIODEGRADATION	Mutagens and Potential Mutagens in the Bio-
ing the Hot Season,	Biological Control: Isolation and Bacterial Ox-	sphere: II. MetalsMercury, Lead, Cadmium
W75-11032 5C	idation of the Taste-and-Odor Compound	and Tin,
30	Geosmin,	W75-11171 5E
Standard Curves for Nuvacron, Malathion,	W75-11013 5F	BIRDO
Sevin, DDT, and Kelthane Tested Against the	Measures of Biodegradability and Refractory	BIRDS
Mosquito Culex Pipiens L. and the	Organics in Wastewaters: (Analysis, Interpreta-	Oil Pollution and Seabirds in Denmark 1935-
Microcrustacean Daphnia Magna Straus,	tion, and Application of Measurement	1968, W75-10893
W75-11082 5B	Techniques),	W 73-10893
	W75-11103 5D	BLACK HILLS (SD)
Uptake of Cadmium, Zinc, Copper, Lead and		Watershed Management in the Black Hills: The
Chromium in the Pacific Oyster, Crassostrea	Investigations on the Long Term Biochemical	Status of Our Knowledge,
Gigas, Grown in the Tamar River, Tasmania,	Oxidation of Sewage,	W75-11318 4E
W75-11086 5B	W75-11116 5D	DI LORDIN
Biomagnification of Dieldrin Besidues by Food	Channel in Variation and Surface Scil Dance	BLACKFLY
Biomagnification of Dieldrin Residues by Food Chain Transfer from Clams to Blue Crabs	Changes in Vegetation and Surface Soil Proper-	The Effects of Experimental Blackfly (Diptera
Under Controlled Conditions,	ties Following Irrigation of Woodlands with Municipal Wastewater,	Simuliidae) Larviciding with Abate, Dursban and Methoxychlor on Stream Invertebrates,
W75-11135 5C	W75-11243 5B	W75-11157 50
11.511155	W15-112-15	W15-11157
Some Effects of Copper on the Polychaete	Biodegradation of Components of Pulp Waste	BLEACHING WASTES
Phyllodoce Maculata,	Effluents by Bacteria. (1). Degradation of Kraft	Evaluation of the Adsorptive Properties of Fly
W75-11136 5C	Lignin (In Japanese),	Ash with Reference to a Pulp and Paper Mil
	W75-11346 5B	Waste Effluent,
Dissipation of Residues of Phenoxy Herbicides	BIODUNG FORG	W75-11335 SE
Applied for Water Milfoil Control in Large	BIOINDICATORS	BLUE CRAB
Reservoirs,	Epifaunal Invertebrates as Indicators of Water Quality in Southern Lake Pontchartain,	Biomagnification of Dieldrin Residues by Food
W75-11198 5B	W75-10852 5C	Chain Transfer from Clams to Blue Crabs
BIOCHEMICAL OXIDATION	W 73-10032	Under Controllled Conditions,
Investigations on the Long Term Biochemical	Use of Productivity of Periphyton to Estimate	W75-11135 50
Oxidation of Sewage.	Water Quality,	POATING
W75-11116 5D	W75-10936 5B	BOATING An Analysis of the Motor-Row Conversion
30	The Use of Cashes are But do I was	Issue of Colorado River Float Trips,
BIOCHEMICAL OXYGEN DEMAND	The Use of Snakes as a Pollution Indicator	W75-10867 61
Investigations on the Long Term Biochemical	Species,	
Oxidation of Sewage,	W75-11089 5B	BOGS
W75-11116 5D	BIOLOGICAL COMMUNITIES	Species Diversity of Benthic Macroin-Ver
P/A	The Role of Planktonic Protozoa in the Marine	tebrates and Limnological Conditions in a 1s
Effluent Characteristics and Treatment of	Food Chain. Seasonal Changes, Relative	Order Mountain Stream,
Mechanical Pulping Effluents,	Abundance, and Cell Size Distribution of Tin-	W75-10918
W75-11331 5D	tinnida,	BOTTOM SEDIMENTS
BIOCHEMISTRY	W75-11191 5C	Application of the Manometric Technique is
An Investigation of Glycolate Excretion in Two	BIOLOGICAL TREATMENT	the Study of Sediment Oxygen Depletion,
Species of Blue-Green Algae,	BIOLOGICAL TREATMENT	W75-11222 50
W75-11230 5C	Population Dynamics of Protozoa in Waste-	BOUNDADIES (SUDEACES)
50	water, W75 10057	BOUNDARIES (SURFACES) Formulation of Boundary Conditions at the
Influence of Oil on Nucleic Acids of Algae,	W75-10957 5D	Formulation of Boundary Conditions at the Surface of a Porous Medium,
W75-11232 5C	Temperature Effects on Microbial Growth in	W75-11269 81
	CSTR's,	
BIOCHROME ANALYSIS	W75-10968 5D	BOUNDARY CONDITIONS
Biochrome Analysis as a Method for Assessing		Formulation of Boundary Conditions at the
Phytoplankton Dynamics, Phase II,	Innovative Process Treats Wastewater,	Surface of a Porous Medium,
W75-11052 , 5C	W75-10975 5D	W75-11269 81

BOUNDARY LAYERS

BOUNDARY LAYERS	Studies on the Inorganic Components of	Wind-Snow Relations at Marmot Creek, Al-
Turbulent Structure Near Smooth Boundary,	Marine Animals-III, on the Contents of Cadmi-	berta,
W75-11148 8B	um, Zinc, Copper, Lead and Iron in Muscle	W75-11226 2C
BOUNDARY PROCESSES	and Viscera of Marine Animals Captured in the West Sea Area of Kyushu, (In Japanese),	B(ritish) C(olumbia) Presses for Forest Indus-
Application of Electrical Analogy to Draw	West Sea Area of Kyushu, (In Japanese), W75-11087 5C	tries Clean-Up.
Flow Nets for Sudden Drawdown Conditions in		W75-11350 5G
Earth Dams,	CAISSONS	
W75-11143 8B	Horizontal Groundwater Collectors, Hydraulics	CANALS
DE A CHIEGOT SE A PERIO	and Design,	Consolidation and Rehabilitation of Canals in
BRACKISH WATER A Note on Salinity and Temperature in Some	W75-10998 8B	Poudre Valley,
Moroccan Brackish Waters,		W75-11061 4A
W75-10997 2L	Horizontal Groundwater Collectors, 'Canada's	
W 73-10997 2L	Largest Water Well',	CANNON RIVER WATERSHED (MINN)
BRAZIL	W75-10999 8B	Water Resources of the Cannon River
Translations on Environmental Quality, No. 33.	CALCIUM CARBONATE	Watershed, Southeastern Minnesota,
W75-11246 5G	The Kinetics of Crystallization of Scale-Form-	W75-10948 7C
	ing Minerals,	CAPE ROMANO (FLA)
BRAZILIAN SNAILS	W75-11273 8G	A Survey of Fishes and Commercial Inver-
Water Hyacinth Research in Puerto Rico,		tebrates of the Nearshore and Estuarine Zone
W75-11215 5G	CALCIUM SULFATE	Between Cape Romano and Cape Sable,
BREAKPOINT CHLORINATION	The Kinetics of Crystallization of Scale-Form-	Florida,
Nitrogen Removal by Catalyst-Aided Break-	ing Minerals,	W75-11189 21
point Chlorination,	W75-11273 8G	
W75-10965 5D	The Kinetics of Crystallization of Scale-Form-	CAPE SABLE (FLA)
	ing Minerals,	A Survey of Fishes and Commercial Inver-
BREAKWATERS	W75-11273 8G	tebrates of the Nearshore and Estuarine Zone
Wave Motion in Rockfill,	W13-11273	Between Cape Romano and Cape Sable,
W75-10924 8D	CALCIUM SULPHATE	Florida,
BREWING INDUSTRY	Calcium Sulfate Solubility in Brackish Water	W75-11189 2I
Pollution Abatement in a Brewing Facility.	Concentrates and Applications to Reverse Os-	
W75-11323 5D	mosis Processes: Polyphosphate Additives,	CAPITAL COSTS
W 13-11323	W75-11004 5D	The Economy of Various Methods for De-
BRITAIN (CONN)		watering Sludge From Biological Purification
Contour Map of the Bedrock Surface, New	CALIFORNIA	(Ueber die Wirtschaftlichkeit verschiedener
Britain Quadrangle, Connecticut,	A Waterborne Gastroenteritis Epidemic in Pico	Verfahren zur Entwaesserung von
W75-10950 7C	Rivers, California,	biologischem Klaerschlamm),
PROPERTY COLUMN AND A STATE OF THE STATE OF	W75-11005 5F	W75-11127 5D
BRITISH COLUMBIA	How Steam is Produced and Handled at the	GARRON BIOWING
Water Resources, W75-11003 5G	Gevers.	CARBON DIOXIDE
W75-11003 5G	W75-11280 4B	Liquid CO2 Protects our Water's Quality,
B(ritish) C(olumbia) Presses for Forest Indus-	1177720	W75-10990 5F
tries Clean-Up.	CAMPBELL RIVER (BC)	Dissolved Gases Are Key Corrosion Culprits,
W75-11350 5G	\$3-Million and Two-and-a-Half Years to Solve	W75-11274 8G
	Campbell River's Sewage Problems,	W/3-112/4
BROMIDES	W75-10977 5D	CARBON DIOXIDE LASER
Modification of the Iodimetric Titration	CINIA	CO2 Laser Effects on Water Hyacinth,
Method for the Determination of Bromide and	CANADA	W75-11209 5G
Its Application to Mixed Domestic-Industrial	Flow File Operations Manual, W75-10913 7C	
Waste Effluents, W75-11341 5A	W 73-10913	CARBON RADIOISOTOPES
W/3-11341 3A	Description of Card and Tape Formats for Sup-	Determination of Regional Hydraulic Conduc-
BULK CARRIERS	plying Data to Users.	tivity Through Use of C-14 Dating of Ground-
Economics of Great Lakes Shipping in an Ex-	W75-10914 7C	water,
tended Season,		W75-10930 2F
W75-11248 6C	\$3-Million and Two-and-a-Half Years to Solve	CARCINOCENS
BURLINGTON (COLO)	Campbell River's Sewage Problems,	CARCINOGENS Stability of Nitrocomines in Samples of Laboratory
BURLINGTON (COLO)	W75-10977 5D	Stability of Nitrosamines in Samples of Lake
Colorado City Solves Its Sand Pumping	Horizontal Groundwater Collectors, 'Canada's	Water, Soil, and Sewage,
Problems, W75-11261 8C	Largest Water Well',	W75-11019 5B
W75-11261 8C	W75-10999 8B	CARIBBEAN SEA
BUSYCON CANALICALATUM	W 75-10999	Near-Bottom Chemistry in the Eastern Pacific
Copper Toxicity in Busycon Canaliculatum L.,	Role and Responsibilities of the Environmental	and North Atlantic Oceans,
W75-11031 5C	Protection Service (Canada),	W75-10923 2K
	W75-11000 6G	1175 10725
CADMIUM		CARTWRIGHT CREEK (TENN)
Retention of Cadmium in Mice Studied by	Oil Spill Technology,	A Study of Factors Controlling the Chemical
Whole Body Autoradiography,	W75-11001 5G	Quality of Water in Cartwright Creek Basin,
W75-11024 5A	Water Resources.	Williamson County, Tennessee,
The Accumulation of Cadmium, Copper, Man-	W75-11003 5G	W75-11164 2K
ganese and Zinc by Fucus Vesiculosus in the	11/2/11005	
Bristol Channel,	Induced Infiltration Supply System Among Big-	CASING
W75-11083 5B	gest.	Techniques for Linear Tie-Back Cementing,
	W75-11010 5F	W75-11277 8F
Uptake of Cadmium, Zinc, Copper, Lead and		CACTAIGG
Chromium in the Pacific Oyster, Crassostrea	The Growth of Some Epiphytic Algae in a Lake	CASINGS
Gigas, Grown in the Tamar River, Tasmania,	Receiving Thermal Effluent,	Pitless Adapters: Emphasis on Sanitation,
W75-11086 5B	W75-11225 5C	W75-11258 8C

CALL COVER OF THE CONTROL CHARACTER OF THE CON

CHI D C M

CAVITATION	bedarfes, CSB(Cr), in Restabwaessern von	Disinfecting Wastewater with Chlorina-
Predicting Cavitation in Sudden Enlargements,	Zellstoff und Papierfabriken).	tion/Dechlorination Part 2,
W75-11151 8B	W75-11337 5A	W75-10964 5D
Contation Control by Assetion of High	CHEMICAL DEACTIONS	Nissan Barral In Cathol Miles Barrie
Cavitation Control by Aeration of High-	CHEMICAL REACTIONS	Nitrogen Removal by Catalyst-Aided Break-
Velocity Jets,	Interactions of Heavy Metals in the Activated	point Chlorination,
W75-11152 8B	Sludge Process,	W75-10965 5D
CAYUGA LAKE (NY)	W75-11173 5D	Chlorine-Containing Organic Constituents in
Utilization of Stream-Borne Phosphorus by	CHEMICAL TREATMENT	
	CHEMICAL TREATMENT	Chlorinated Effluents,
Cayuga Lake Phytoplankton,	Process for Treating Sewage Sludge,	W75-10970 5D
W75-11036 5C	W75-11064 5D	A Waterhame Costroenteritis Enidemic in Dice
CEMENTING		A Waterborne Gastroenteritis Epidemic in Pico Rivers, California,
	Process for Treating Industrial Wastes,	W75-11005 5F
Techniques for Linear Tie-Back Cementing,	W75-11066 5D	W/3-11003
W75-11277 8F	D	CHLORINE
CEMENTS	Process for Treating Industrial Wastes,	Chlorine-Containing Organic Constituents in
Techniques for Linear Tie-Back Cementing,	W75-11067 5D	Chlorinated Effluents,
W75-11277 8F	Process for Raw Water Clarification.	W75-10970 5D
W/3-112//		W 13-10970 3D
How BP Alaska Cements Through Permafrost.	W75-11072 5F	CHLOROPHYLL
W75-11278 8F	CHEMICAL WASTES	Biochrome Analysis as a Method for Assessing
W/3-112/6		Phytoplankton Dynamics, Phase II,
How to Make Squeeze Cementing Successful,	Upgrading Metal-Finishing Facilities to Reduce	W75-11052 SC
W75-11286 8F	Pollution. (Part 1). In-Process Pollution Abate-	11/0/11002
17.7.11.200	ment,	CHLOROPHYTA
Cementing Today's Problem Wells.	W75-11324 5D	Influence of Oil on Nucleic Acids of Algae,
W75-11293 8F	Hamadian Matal Philips - P. Wat P. C.	W75-11080 5C
11070	Upgrading Metal-Finishing Facilities to Reduce	W.75-11000 3C
CENTRIFUGATION	Pollution. (Part 2). Waste Treatment,	Electrolytic Control of Algae,
Dewaters Sludge.	W75-11325 5D	W75-11228 5F
W75-10966 5D		1113 11220
W 75-10300	Upgrading Textile Operations to Reduce Pollu-	CHROMIUM
CHANNEL CATFISH	tion. (Part 2). Wastewater Treatment Systems.	Uptake of Cadmium, Zinc, Copper, Lead and
Survival and Growth Rate of Channel Catfish	W75-11327 5D	Chromium in the Pacific Oyster, Crassostrea
as a Function of Dissolved-Oxygen Concentra-	CHIPA MCMP 1	Gigas, Grown in the Tamar River, Tasmania,
tion,	CHEMISTRY	W75-11086 5B
W75-11051 5C	Near-Bottom Chemistry in the Eastern Pacific	11/2/11/00
1175-11051	and North Atlantic Oceans,	CHROMONADAE
CHANNEL EROSION	W75-10923 2K	The Influence of the Warm Cooling Water from
Factors Affecting Erosion in a Semi-Arid	CHECKER ALLCC	a Fossil Fueled Power Plant on Oceanographic
Watershed,	CHESTER (MASS)	Conditions and Composition of Plankton in
W75-10884 2J	Map Showing Depth to Bedrock, Chester	Owase Bay I. Water Temperature in Relation to
	Quadrangle, Massachusetts,	Distribution of Microplankton, (In Japanese),
CHARA	W75-10953 · 7C	W75-11030 5C
A Contribution to the Biology of Nitella	CHICK LUCKING PROPERTION (U.S.)	1170 11000
Hookeri A. BR. in the Rotorua Lakes, New	CHICKAHOMINY RESERVOIR (VA)	CITRUS FRUITS
Zealand. II. Organic Nutrients and Physical	Aquatic Plant Control Using Herbicides in a	Phytophthora Species in Arizona: Its Occur-
Factors,	Large Potable Water Supply,	rence in Recycled Irrigation water,
W75-11235 5C	W75-11201 5G	W75-10883 5A
	CHI ODINATED HYDROCADBON	
CHATAUQUA LAKE (NY)	CHLORINATED HYDROCARBON	CLAMS
Root:Shoot and Leaf Area Relationships of	Toxaphene Effects on Growth and Bone Com-	A Reevaluation of the Combined Effects of
Macrophyte Communities in Chautauqua Lake,	position of Fathead Minnows, Pimephales	Temperature and Salinity on Survival and
New York,	Promelas,	Growth of Bivalve Larvae Using Response
W75-11009 5C	W75-11026 5C	Surface Techniques,
A Marian Control of the Control of t	Diamonification of Dialdrin Desidues by Fred	W75-11081 5C
CHELATION	Biomagnification of Dieldrin Residues by Food	
Chelation Study of Copper (II): Fulvic Acid	Chain Transfer from Clams to Blue Crabs	Biomagnification of Dieldrin Residues by Food
System,	Under Controllled Conditions, W75-11135 5C	Chain Transfer from Clams to Blue Crabs
W75-11219 5B	W75-11135 5C	Under Controllled Conditions,
	CHLORINATED HYDROCARBON PESTICIDES	W75-11135 5C
CHEMCONTROL	The Use of Snakes as a Pollution Indicator	CI I DIFFICI TION
Chemical Control of Egeria Densa,	Species,	CLARIFICATION
W75-11199 5G	W75-11089 5B	Process for Raw Water Clarification,
CHEMICAL ANALYSIS	11 /3-11007 JB	W75-11072 5F
CHEMICAL ANALYSIS	Mutagens and Potential Mutagens in the Bio-	CLAYS
The Minor and Trace Elements, Gas, and	sphere: I. DDT and Its Metabolites,	Ground Water Depletion and Subsidence
Isotope Compositions of the Principal Hot	Polychlorinated Biphenyls, Chlorodioxins,	
Springs of Nevada and Oregon,	Polycyclic Aromatic Hydrocarbons,	Problems in Taipei Basin, W75-11262 4B
W75-10937 2K	Haloethers,	W 13-11202 4B
CHEMICAL DEGRADATION	W75-11170 5B	CLIMATIC DATA
Basic Concepts and Practical Aspects of Corro-		Water Resource Observatory Climatological
sion Investigation,	CHLORINATION	Data, Water Year 1973.
W75-11271 8G	Ozone Treatment Licks Color Problem.	W75-11035 7C
W/3412/1 8G	W75-10959 5D	11.5-11055 /C
CHEMICAL OXYGEN DEMAND	30	CLOUD PHYSICS
Determination of Chemical Oxygen Demand,	Disinfecting Wastewater with Chlorina-	Charged Droplet Collision Efficiency Measure-
COD(Cr), in Waste Waters of Pulp and Paper	tion/Dechlorination Part 1,	ments.
Mills (Bestimmung des chemischen Sauerstoff-	W75-10963 5D	W75-11168 2B

CC

cc

cc

COI A Si

COAGULATION

COAGULATION	COLORADO	Hierarchial Model for Water-Supply-System
Flocculation Device for Waste Fluid Treat-	Analysis of Colorado Precipitation,	Control,
ment, W75-11077 5D	W75-11040 2B	W75-10996 4A
W75-11077 5D	Consolidation and Rehabilitation of Canals in	An Assessment of Snowpack Depletion-Sur-
Total Waste Recycle System for Water Purifi-	Poudre Valley,	face Runoff Relationships on Forested
cation Plant Using Alum as Primary Coagulant,	W75-11061 4A	Watersheds, W75-11049 4A
W75-11094 5D	An Elevational Control of Peak Snowpack	W75-11049 4A
COAL MINE WASTES	Variability,	An Economic Analysis of the Pollution
Acid Strip Mine Lake Recovery,	W75-11155 2C	Problems in the Colorado River Basin: The
W75-11224 5C	Colorado City Solves Its Sand Pumping	Upper Main Stem Sub-Basin,
COASTAL AQUIFERS	Problems.	W75-11247 5G
Management of Retardation of Salt Water In-	W75-11261 8C	Workshop on Computer-Aided Design and
trusion in Coastal Aquifers,		Simulation of Waste Treatment Systems.
W75-11058 2F	Pollution Abatement in a Brewing Facility.	W75-11338 5D
COASTAL ENGINEERING	W75-11323 5D	COMPUTER PROGRAMS
Stabilization and Reconstruction of Texas	COLORADO RIVER	Two-Dimensional, Hydrostatic Simulation of
Coastal Foredunes with Vegetation,	An Analysis of the Motor-Row Conversion	Thermally-Influenced Hydrodynamic Flows,
W75-10887 2L	Issue of Colorado River Float Trips,	W75-10901 2H
W	W75-10867 6B	A Communa Property Problems for Asseti-
Wave Motion in Rockfill, W75-10924 8D	Impact of Energy Development on the Law of	A Computer Program Package for Aquatic Ecologists,
W75-10924 8D	the Colorado River,	W75-10908 2H
COBBLE ABRASION	W75-10869 4C	211
Measurement of Cobble Abrasion in Natural	Walter was to the second	Automated Distribution of Gauge and Shift
Streams,	Man's Impact on a Newly Formed Reservoir,	Corrections,
W75-10881 2J	W75-11233 5C	W75-10911 7C
COHO SALMON	COLORADO RIVER BASIN	Automated Tidal Computations,
Effects of Some Components of Crude Oil on	Legal and Institutional Problems in the	W75-10912 7C
Young Coho Salmon,	Management of Salinity,	
W75-11088 5C	W75-11047 5G	Flow File Operations Manual, W75-10913 7C
COLEBROOK-WHITE TRANSITION.	An Economic Analysis of the Pollution	W/3-10913
*AIRPORT DRAINAGE	Problems in the Colorado River Basin: The	Automated Hourly Computations,
The Design of Storm Water Drainage Channels	Upper Main Stem Sub-Basin,	W75-10915 7C
Using Mathematical Model Techniques,	W75-11247 5G	Community of Water Distribution
W75-11150 8B	COLORIMETRY	Computer Analysis of Water-Distribution Systems,
COLIFORMS	Interference of Mercury(II) in the Colorimetric	W75-11182 4A
Disinfecting Wastewater with Chlorina-	Determination of Inorganic Phosphate in	
tion/Dechlorination Part 1,	Water,	Advanced Techniques in the Mathematical
W75-10963 5D	W75-11340 . 5A	Modeling of Water-Distribution Systems, W75-11183 4A
Drug Resistant Coliforms Call for Re-Evalua-	Interference of Sulfate Ion on SPADNS	W/3-11103
tion of Water Quality Standards,	(Sodium 2-(Sulfophenylazo)-1,8-Dihydrox-	COMPUTERS
W75-11130 5B	ynaphthalene-3,6-Disulfonate) Colorimetric	Hierarchial Model for Water-Supply-System
COLLISION EFFICIENCIES	Determination of Fluorine in Waste Waters,	Control, W75-10996 4A
Charged Droplet Collision Efficiency Measure-	W75-11343 5A	W /3-10990 4A
ments,	COMBINED TREATMENT	Computer Systems and Water Resources,
W75-11168 2B	Industry and Community in Cooperation,	W75-11174 6A
COLLOIDS	W75-10985 5D	Computer Analysis of Water-Distribution
COLLOIDS Study of Electrochemical Treatment Method	COMPETITION	Systems,
for Removing Colloidal Particles from Pulp and	The Influence of Rainfall on the Reproduction	W75-11182 4A
Paper Industry Effluents (Tutkimus selluteol-	of Sonoran Desert Lagomorphs,	Constant Balls Consta
lisuuden jatevesien kolloidaalisten ainesten	W75-10871 4A	Can a Computer Really Operate a Water-Filtra- tion Plant,
poistomahdollisuudesta sahkokemialliesti),	The Influence of Density and Nitrogen on the	W75-11184 5F
W75-11348 5D	Outcome of Competition Between Two Annual	
COLOR	Pasture Grasses (Hordeum Leporinum Link	CONCRETE ADDITIVES
Organic Color in Groundwater of Mississippi,	and Lolium Rigidum Gaud.),	Cementing Today's Problem Wells.
W75-10907 5F	W75-10889 3F	W75-11293 8F
Evaluation of the Adsorptive Properties of Fly	COMPREHENSIVE PLANNING	CONCRETE TECHNOLOGY
Ash with Reference to a Pulp and Paper Mill	A Mathematical Model for Optimal Waste	Cementing Today's Problem Wells.
Waste Effluent,	Load Allocations,	W75-11293 8F
W75-11335 5D	W75-11102 5G	CONDENSATION
Effect of Lime Treatment on Molecular Weight	Strategic Approach to Estuarine Environmental	Condensation in Jets, Industrial Plumes and
Distribution of Color Bodies from Kraft Liner-	Management,	Cooling Tower Plumes,
board Decker Effluents,	W75-11179 2L	W75-11166 2B
W75-11345 5D	COMPLITED MODELS	CONDUCTIVITY
COLOR REMOVAL	COMPUTER MODELS Two-Dimensional, Hydrostatic Simulation of	Specific Conductance Method for in Situ Esti-
Ozone Treatment Licks Color Problem.	Thermally-Influenced Hydrodynamic Flows,	mation of Total Dissolved Solids,
W75-10959 5D	W75-10901 2H	W75-11167 5A

CONFERENCES	COPPER	COST ANALYSIS
Review of Conference on Hydrology of Deep	Copper Toxicity in Busycon Canaliculatum L.,	Will Submersibles Make Jet Pumps Obsolete.
Sedimentary Basins,	W75-11031 5C	W75-11263 8C
W75-10935 5B		
	The Accumulation of Cadmium, Copper, Man-	Drilling Rate Affects Costs More than Bit Life,
CONICAL BIT	ganese and Zinc by Fucus Vesiculosus in the	W75-11279 8C
'Self-Tapping Screw' Bit Would Use Lighter	Bristol Channel,	and the same of the same
Weights,	W75-11083 5B	COST-BENEFIT ANALYSIS
W75-11283 8C		Economics of Great Lakes Shipping in an Ex-
	Uptake of Cadmium, Zinc, Copper, Lead and	tended Season,
CONNATE WATER	Chromium in the Pacific Oyster, Crassostrea	W75-11248 6C
Theory of Plasticity of Porous Media with	Gigas, Grown in the Tamar River, Tasmania,	
Fluid Flow,	W75-11086 5B	COST COMPARISON
W75-11276 8E		Will Submersibles Make Jet Pumps Obsolete.
	Studies on the Inorganic Components of	W75-11263 8C
CONNECTICUT	Marine Animals-III, on the Contents of Cadmi-	
Contour Map of the Bedrock Surface, New	um, Zinc, Copper, Lead and Iron in Muscle	COST SHARING
Britain Quadrangle, Connecticut,	and Viscera of Marine Animals Captured in the	Cost Sharing to Help Clean Our Waterways.
W75-10950 7C	West Sea Area of Kyushu, (In Japanese),	W75-11023 5G
	W75-11087 5C	
Map Showing Depth to Bedrock, Mount Car-		COSTS
mel Quandrangle, Connecticut,	Some Effects of Copper on the Polychaete	Pump Selection,
W75-10954 7C	Phyllodoce Maculata,	W75-11002 8C
	W75-11136 5C	
Floodplain Land-Use Management: An Appli-		Cost Evaluation of Watercourse Management
cation of Operations Research Methodology,	Chelation Study of Copper (II): Fulvic Acid	in Essex,
W75-11037 6F	System,	W75-11008 5G
	W75-11219 5B	
CONSTRUCTION COSTS	W/3-11219 3B	How to Estimate and Escalate Costs of Waste-
Underground Wastewater Treatment Plants,	COPPER SULFATE	water Equipment,
W75-10974 5D	Preliminary Investigations into Copper Cycling	W75-11014 5D
	in Indian Lake, Massachusetts: A Lake Treated	
High Costs Modify Sewage Plant Expansion.		Cost Sharing to Help Clean Our Waterways.
W75-10993 5D	Annually with Copper Sulfate,	W75-11023 5G
	W75-11039 5B	117211025
CONTROL	CORAL	Unconventional Air Drilling Reduces Well
Can a Computer Really Operate a Water-Filtra-		Costs.
tion Plant,	A Comparison of Effects of Elevated Tempera-	W75-11270 8C
W75-11184 5F	ture Versus Temperature Fluctuations on Reef	
	Corals at Kahe Point, Oahu,	COTTON
Macroscopic Distribution-System Modeling,	W75-11084 5C	Scheduling and Application Rates of Irrigation
W75-11185 4A	CORPUT ALL	in a Humid Climate,
	COREXIT 8666	W75-11048 3F
CONTROL SYSTEMS	The Effects of Crude Oils and the Dispersant	W/3-110-10
Hierarchial Model for Water-Supply-System	Corexit 8666 on Sea Urchin Gametes and Emb-	COVARIANCE ANALYSIS
Control,	ryos,	Covariance Analysis of Reservoir Development
W75-10996 4A	W75-11090 5C	Effects on Property Tax Base,
		W75-10851 6B
CONVOLUTION METHOD	CORROSION	W 73-10831 OB
Predicting Recessions Through Convolution,	Corrosion by Domestic Waters,	CRABS
W75-10917 2E	W75-11062 5F	Biomagnification of Dieldrin Residues by Food
COOL DIG TOWNS		Chain Transfer from Clams to Blue Crabs
COOLING TOWERS	Longer Life for Submersibles.	Under Controllled Conditions,
Condensation in Jets, Industrial Plumes and	W75-11259 8G	W75-11135 5C
Cooling Tower Plumes,		W/3-11133
W75-11166 2B	Basic Concepts and Practical Aspects of Corro-	CRASSOSTREA GIGAS
COOL DIG WATER	sion Investigation,	Uptake of Cadmium, Zinc, Copper, Lead and
COOLING WATER	W75-11271 8G	
Experimental Study of the Cooling Water	DI 1 10 1 P 0 1 D 1	Chromium in the Pacific Oyster, Crassostrea
System, Setubal Power Plant, Rio Sado, Portu-	Dissolved Gases Are Key Corrosion Culprits,	Gigas, Grown in the Tamar River, Tasmania,
gal,	W75-11274 8G	W75-11086 5B
W75-10855 5B	W	CROP PRODUCTION
71 1 0 0 W 0 W W	How to Conduct Corrosion Tests,	
The Influence of the Warm Cooling Water from	W75-11292 8G	Effects of Irrigation in Rain-Fed Fields on the
a Fossil Fueled Power Plant on Oceanographic	CORPORION CELL	Growth and Yield of Upland Rice Varieties, (In
Conditions and Composition of Plankton in	CORROSION CELL	Korean),
Owase Bay I. Water Temperature in Relation to	Dissolved Gases Are Key Corrosion Culprits,	W75-10853 3F
Distribution of Microplankton, (In Japanese),	W75-11274 8G	Effects of Antitroposition - Vill Co.
W75-11030 5C	CORROGION CONTRO!	Effects of Antitranspirants on Yield of Grain
	CORROSION CONTROL	Sorghum Under Limited Irrigation,
Design of the Optimal Outfall System for a	Corrosion by Domestic Waters,	W75-10858 3F
Stream Receiving Thermal and Organic Waste	W75-11062 5F	Patientian of Safe Paint & Committee
Discharges,		Estimation of Safe Periods for Crop Planning
W75-11137 5B	How to Conduct Corrosion Tests,	Under Dryland Agriculture,
	W75-11292 8G	W75-10926 3F
Dissolved Gas Supersaturation and Dilution in	CORROCION TRETS	CRYSTAL CROWTH
Thermal Plumes from Steam Electric Generat-	CORROSION TESTS	CRYSTAL GROWTH
ing Stations,	How to Conduct Corrosion Tests,	The Kinetics of Crystallization of Scale-Form-
W75-11159 5B	W75-11292 8G	ing Minerals,
CORRECT		W75-11273 8G
COPEPODS	CORVALLIS-ALBANY AREA (ORE)	CUI EV SIBIRIO
Adaptation of Copepod Populations to Thermal		CULEX PIPIENS
	Ground Water in the Corvallis-Albany Area,	
Stress,	Central Willamette Valley, Oregon,	Standard Curves for Nuvacron, Malathion,
W75-11046 5C		

'Se' We W7

Plo Flo W7

Ter Pro sid-W7

PETE Fire Sev W7

DEW. Dev W7

The wat (Ue Ver biol W7

Bar for W7

DIAT Rei pH W7

DIEL Abs Day W7

Bio Cha Un W7 DIGE Qua of Hap Ug

DIPT The Sin and W7

Exp Sys gal. W7 Des

DISIN Wa Ozo W7

Dis tion W7

CULEX PIPIENS

Mosquito Culex Pipiens L. and the Microcrustacean Daphnia Magna Straus, W75-11082 5B	DATE STORAGE AND RETRIEVAL Description of Card and Tape Formats for Supplying Data to Users.	DEPLETION EFFECTS Deprivation Contribution and Interference Effects of Multiple Wells in a Common Aquifer,
CVANODHYTA	W75-10914 7C	W75-11142 4B
CYANOPHYTA An Investigation of Glycolate Excretion in Two Species of Blue-Green Algae,	DDT Effect of DDT and M.S. 222 on Learning a	DEPTH TO BEDROCK Map Showing Depth to Bedrock, Worthington
W75-11230 5C	Simple Conditioned Response in Rainbow	Quadrangle, Massachusetts, W75-10951 7C
DAMS	Trout (Salmo gairdneri), W75-11025 5C	W 73-10951
Wave Motion in Rockfill,	W75-11025 SC	Map Showing Depth to Bedrock, Greenfield
W75-10924 8D	Standard Curves for Nuvacron, Malathion,	Quadrangle, Massachusetts,
DAPHNIA	Sevin, DDT, and Kelthane Tested Against the	W75-10952 7C
Absorption and Elimination of Photodieldrin by	Mosquito Culex Pipiens L. and the Microcrustacean Daphnia Magna Straus,	Map Showing Depth to Bedrock, Chester
Daphnia and Goldfish,	W75-11082 . 5B	Quadrangle, Massachusetts,
W75-11085 5B		W75-10953 7C
DAPHNIA MAGNA Standard Curves for Nuvacron, Malathion,	Mutagens and Potential Mutagens in the Bio- sphere: I. DDT and Its Metabolites,	Map Showing Depth to Bedrock, Mount Car- mel Quandrangle, Connecticut,
Sevin, DDT, and Kelthane Tested Against the	Polycyclic Aromatic Hydrocarbons,	W75-10954 7C
Mosquito Culex Pipiens L. and the	Haloethers,	DESALINATION
Microcrustacean Daphnia Magna Straus, W75-11082 5B	W75-11170 5B	Calcium Sulfate Solubility in Brackish Water
W/3-11082 3B	DEALE ALIZATION	Concentrates and Applications to Reverse Os-
DARCYS LAW	DEALKALIZATION System for Softening and Dealkalizing Water	mosis Processes: Polyphosphate Additives,
Wave Motion in Rockfill,	by Electrodialysis,	W75-11004 5D
W75-10924 8D	W75-11065 5F	Electrolytic Sea Water Process,
DATA ACQUISITION	DECISION MAKING	W75-11068 3A
Computer Systems and Water Resources,	Floodplain Land-Use Management: An Appli-	DESERT PAVEMENT
W75-11174 6A	cation of Operations Research Methodology,	Barrenness of Desert Pavement in Yuma Coun-
DATA COLLECTIONS	W75-11037 6F	ty, Arizona,
A Computer Program Package for Aquatic	The Louisiana Environmental Management	W75-10868 2G
Ecologists,	System and Its Utility in Water Resource	DESERT PLANTS
W75-10908 2H	Planning,	Phenology of Selected Sonoran Desert Plants at
Water Resource Observatory Climatological	W75-11177 5G	Punta Cirio, Sonora, Mexico.
Data, Water Year 1973. W75-11035 7C	DECOMPOSING ORGANIC MATTER	W75-10862 21
The Table of Davis Field Comments	Changes in Vegetation and Surface Soil Proper-	Products from Jojoba: A Promising New Crop for Arid Lands.
The Toxicity of Drilling Fluid Components to Aquatic Biological Systems, A Literature	ties Following Irrigation of Woodlands with Municipal Wastewater,	W75-10890 3F
Review,	W75-11243 5B	
W75-11266 5C	DEED CENTRIEST ABY BACING	DESIGN Desirable Provision in Current Designs for Fu-
DATA PROCESSING	DEEP SEDIMENTARY BASINS Review of Conference on Hydrology of Deep	ture Development in Relation to Reclamation
Automated Distribution of Gauge and Shift	Sedimentary Basins,	of Effluent,
Corrections,	W75-10935 5B	W75-10980 5D
W75-10911 7C	DEEP SHAFT PROCESS	Use of Steelon-Net Veils for Protection of the
Automated Tidal Computations,	ICI's Deep Shaft 'Halves Sludge Volume',	Hydro-Engineering Works Against Dreissena
W75-10912 7C	W75-10981 5D	Polymorphia Pall, W75-11033 5G
Flow File Operations Manual,	DENITRIFICATION	W75-11033 5G
W75-10913 7C	Concurrent Nitrification-Denitrification at the	Continuous Automatic Monitoring of Surface
Description of Card and Tape Formats for Sup-	Sediment-Water Interface as a Mechanism for	Water with Fish, W75-11079 5A
plying Data to Users.	Nitrogen Losses from Lakes,	
W75-10914 7C	W75-10902 5C	Improved Design of Distribution Networks by
Automated Hourly Computations,	Pilot-Plant Study of Denitrification Using a	Minimum Route, W75-11175 4A
W75-10915 7C	Submerged Sand Filter at Rye Meads Sewage	
Water Resource Observatory Climatological	Works, W75-10955 5D	Workshop on Computer-Aided Design and Simulation of Waste Treatment Systems.
Data, Water Year 1973.	Nitrogen Removal in a Pilot Plant,	W75-11338 5D
W75-11035 7C	W75-10984 5D	DESIGN CRITERIA
The Louisiana Environmental Management	DENMARK	Experimental Study of the Cooling Water
System and Its Utility in Water Resource	Oil Pollution and Seabirds in Denmark 1935-	System, Setubal Power Plant, Rio Sado, Portu-
Planning, W75-111. 5G	1968,	gal, W75-10855 5B
	W75-10893 5C	
Making Log Analysts of Geologists. W75-11288 7C	DENSITY STRATIFICATION	Improved Design and Operating Criteria for
	Some Results on Mass Transfer Processes in a	Rural Water Districts, W75-11056 6D
DATA STORAGE AND RETRIEVAL	Density-Stratified Flow,	
Automated Distribution of Gauge and Shift Corrections,	W75-11057 8B	Huntingdon Research Centre Pasveer Oxida- tion PlantSix Years On,
W75-10911 7C	DEPLETED AQUIFER	W75-11115 5D
	Deprivation Contribution and Interference Ef-	
Flow File Operations Manual, W75-10913 7C	fects of Multiple Wells in a Common Aquifer, W75-11142 4B	Predicting Cavitation in Sudden Enlargements, W75-11151
	40	

'Self-Tapping Screw' Bit Would Use Lighter	Disinfecting Wastewater with Chlorina-	DOCUMENTATION
Weights,	tion/Dechlorination Part 2,	The Awareness of the Relevant Water
W75-11283 8C	W75-10964 5D	Resources Literature by the Personnel of the
DESIGN FLOODS	DISPERSION	Wisconsin Department of Natural Resources, W75-10899 10C
Flood Runoff from Urban Areas,	Hydraulic Modeling of Mixing Phenomena in	W 73-10899
W75-10904 5B	Stratified Lakes,	DOMESTIC WATER
	W75-11043 2H	City/Township Joint Venture A New Water
DETERGENTS		Plant,
Tensids (Syndets) and the Water Pollution	Process Studies and Modeling of Self-Cleaning	W75-11015 5F
Problem, (Gesund-Heitliche Aspekte Des Ten-	Capacity of Mountain Creeks for Recreation	Committee by Dominal Water
sid-Gebrauchs),	Planning and Management,	Corrosion by Domestic Waters, W75-11062 5F
W75-11134 5D	W75-11055	W 75-11002
DETROIT (MICH)	DISSOLUTION RATES	DOWNHOLE PUMPING
First Stage of the World's Largest Pure Oxygen	A Study of Factors Controlling the Chemical	Installing Submersibles.
Sewage Plant to Undergo Test.	Quality of Water in Cartwright Creek Basin,	W75-11264 8C
W75-10960 5D	Williamson County, Tennessee,	
	W75-11164 2K	DRAINAGE SYSTEMS
DEWATERING		Cost Evaluation of Watercourse Management
Dewaters Sludge.	DISSOLVED AIR FLOTATION	in Essex, W75-11008 5G
W75-10966 5D	Algae Removal Using Dissolved Air Flotation,	W/3-11006 3G
The Economy of Various Methods for De-	W75-10978 5D	DREISSENA POLYMORPHA
watering Sludge From Biological Purification	DISSOLVED OXYGEN	Use of Steelon-Net Veils for Protection of the
(Ueber die Wirtschaftlichkeit verschiedener	Survival and Growth Rate of Channel Catfish	Hydro-Engineering Works Against Dreissena
Verfahren zur Entwaesserung von	as a Function of Dissolved-Oxygen Concentra-	Polymorphia Pall,
biologischem Klaerschlamm),	tion,	W75-11033 5G
W75-11127 5D	W75-11051 5C	DRILL BIT
		'Self-Tapping Screw' Bit Would Use Lighter
Bark as Trickling-Filter Dewatering Medium	Process Studies and Modeling of Self-Cleaning	Weights,
for Pulp and Paper Mill Sludge,	Capacity of Mountain Creeks for Recreation	W75-11283 8C
W75-11241 5D	Planning and Management,	
DIATOMS	W75-11055 5B	DRILL BIT DESIGN
Relations Between Algal Populations and the	DISSOLVED OXYGEN *ELECTROCHEMISTRY	Drilling Rate Affects Costs More than Bit Life,
pH of Their Media,	Dissolved Gases Are Key Corrosion Culprits,	W75-11279 8C
W75-11028 5C	W75-11274 8G	DRILL STEM TEST DATA
W/5-11020	00	Simple Field Checks Will Provide Accurate
DIELDRIN	DISSOLVED SOLIDS	DST Data,
Absorption and Elimination of Photodieldrin by	A Study of Factors Controlling the Chemical	W75-11281 8G
Daphnia and Goldfish,	Quality of Water in Cartwright Creek Basin,	
W75-11085 5B	Williamson County, Tennessee,	DRILLING
Biomagnification of Dieldrin Residues by Food	W75-11164 2K	Unconventional Air Drilling Reduces Well
Chain Transfer from Clams to Blue Crabs	Specific Conductance Method for in Situ Esti-	Costs. W75-11270 8C
Under Controllled Conditions,	mation of Total Dissolved Solids,	W /3-112/0
W75-11135 5C	W75-11167 5A	Simple Field Checks Will Provide Accurate
		DST Data,
DIGESTION	Dissolved Organic Matter and Lake Metabol-	W75-11281 8G
Quantitative Estimation of the Daily Ingestion	ism,	How to Find Tourising Zones in Sufe France
of Phytoplankton by Tilapia Nilotica and	W75-11188 5C	How to Find Transition Zones in Soft Forma- tions,
Haplochromis Nigripinnis in Lake George,	DISTILLATION	W75-11285 8G
Uganda,	Vacuum Distillation/Vapor Filtration Water	1173-11203
W75-11268 2H	Recovery,	Casing-Seat Testing - Why and How,
DIPTERA	W75-11315 5D	W75-11291 8F
The Effects of Experimental Blackfly (Diptera:		How Downhole Temperatures, Pressures Af-
Simuliidae) Larviciding with Abate, Dursban,	DISTRIBUTION PATTERNS	fect Drilling; Part 4: Pitfalls in Overpressure
and Methoxychlor on Stream Invertebrates,	Time-Variant Characteristics of Selected	Prediction,
W75-11157 5C	Wastewater Treatment Plants of Nevada,	W75-11294 8G
BICCHARGE ANA TERM	W75-11245 5D	
DISCHARGE (WATER) Experimental Study of the Cooling Water	DISTRIBUTION SYSTEMS	How Downhole Temperatures, Pressures Af-
System, Setubal Power Plant, Rio Sado, Portu-	Practical Application of Surface Fixed-System	fect Drilling; Part 5: Predicting Hydrocarbon
gal,	for Multi-Purpose Sprinkler Irrigation Uses, (In	Environments with Wireline Data, W75-11295 8G
W75-10855 5B	Japanese),	W 75-11293
	W75-11097 3F	How Downhole Temperatures, Pressures Af-
Description of Card and Tape Formats for Sup-		fect Drilling; Part 6: Correlating Geopressure
plying Data to Users.	Distribution-System Operation Analysis Model,	Gradients with Hydrocarbon Accumulations,
W75-10914 7C	W75-11180 5D	W75-11296 8G
DISINFECTION	Finite-Element Method for Water-Distribution	How Downhole Temperatures, Pressures Af-
Water and Wastewater Disinfection with	Networks,	fect Drilling; Part 7: The Shale Resistivity Ratio
Ozone: A Critical Review.	W75-11186 4A	- A Valuable Tool for Making Economic
W75-10956 5D		Drilling Decisions,
Lanca and the same of the same	DISTRICT OF COLUMBIA	W75-11297 8G
Disinfecting Wastewater with Chlorina-	Population Dynamics of Protozoa in Waste-	
tion/Dechlorination Part 1,	water,	How Downhole Temperatures, Pressures Af-
W75-10963 5D	W75-10957 5D	fect Drilling; Part 8: Needless Spending of

EN

ENI In th

ENIT TWEET TO WE ENVIRONMENT TO CARROLL WAS A LIST WAS

TH (N W Ar Pro UI

Gu En Or W

ENV. Sir cie

Th Uti W7

Piti W7

EPID A V Riv W7

EPIF. Epi Qu: W7

DRILLING

Drilling and Exploration Money Can Be Pre-	EARTH DAMS	Economic Analysis of Effluent Guidelines:
dicted-And Prevented,	Application of Electrical Analogy to Draw	Meat Packing Industry,
W75-11298 8G	Flow Nets for Sudden Drawdown Conditions in	W75-11249 5G
DRILLING EQUIPMENT	Earth Dams,	Economic Analysis of Effluent Guidelines. Fer-
Drilling Rate Affects Costs More than Bit Life,	W75-11143 8B	roalloys Industry.
W75-11279 8C	ECOLOGY	W75-11250 5G
	Environmental Impact Evaluation in Fresh-	and the second s
Special Annulus Fluid Eases Casing Recovery.	water Impoundments by Vegetation Analysis of	EGERIA DENSA
W75-11282 8G	the Terrestrial Ecosystem,	Chemical Control of Egeria Densa,
'Self-Tapping Screw' Bit Would Use Lighter	W75-10905 2I	W75-11199 5G
Weights,	A Commuter Deserve Dealers for Asset	EJECTOR PUMP
W75-11283 8C	A Computer Program Package for Aquatic Ecologists,	Will Submersibles Make Jet Pumps Obsolete.
	W75-10908 . 2H	W75-11263 8C
DRILLING FLUID	1112 10200	ELECTRIC CURRENTS
The Toxicity of Drilling Fluid Components to	ECONOMIC ANALYSIS	Electrical Tests for Submersible Pumps,
Aquatic Biological Systems, A Literature Review,	Floodplain Land-Use Management: An Appli-	W75-11260 8G
W75-11266 5C	cation of Operations Research Methodology,	W 75-11200
W/3-11200	W75-11037 6F	ELECTRIC GENERATORS
DRILLING FLUIDS	ECONOMIC IMPACT	A Comparison of Effects of Elevated Tempera-
Acute Toxicity of Petrochemical Drilling Fluids	Economic Analysis of Effluent Guidelines:	ture Versus Temperature Fluctuations on Reef
Components and Wastes to Fish,	Meat Packing Industry,	Corals at Kahe Point, Oahu,
W75-11265 5C	W75-11249 5G	W75-11084 5C
Tests Show Potassium Mud Versatility,		ELECTRIC POWER PRODUCTION
W75-11284 8G	Economic Analysis of Effluent Guidelines. Fer-	Impact of Energy Development on the Law of
	roalloys Industry.	the Colorado River,
DRILLING RATE	W75-11250 5G	W75-10869 4C
Drilling Rate Affects Costs More than Bit Life,	The Economic Impact of Pollution Abatement:	ELECTRICAL POLITICAL
W75-11279 8C	The Case of Water Pollution by Degradable Or-	ELECTRICAL EQUIPMENT Electrical Tests for Submersible Pumps.
DROPS (FLUIDS)	ganic Matter,	W75-11260 8G
Charged Droplet Collision Efficiency Measure-	W75-11254 5G	W 75-11200
ments,	400000000000000000000000000000000000000	ELECTROCHEMISTRY
W75-11168 2B	ECONOMIC PLANTS	Study of Electrochemical Treatment Method
	Products from Jojoba: A Promising New Crop for Arid Lands.	for Removing Colloidal Particles from Pulp and
DROUGHTS	W75-10890 3F	Paper Industry Effluents (Tutkimus selluteol-
International Development Strategies for the	W 73-10890 3F	lisuuden jatevesien kolloidaalisten ainesten
Sahel. W75-10861 4A	ECONOMICS	poistomahdollisuudesta sahkokemialliesti), W75-11348 5D
W/3-10001 4A	Cost Sharing to Help Clean Our Waterways.	W75-11348 5D
DRUG RESISTANT BACTERIA	W75-11023 5G	ELECTRODIALYSIS
Drug Resistant Coliforms Call for Re-Evalua-	W. C. W. D. M. F. W D. L.	System for Softening and Dealkalizing Water
tion of Water Quality Standards,	Upgrading Meat Packing Facilities to Reduce	by Electrodialysis,
W75-11130 5B	Pollution. (Part 3). Choosing the Optimum Financial Strategy,	W75-11065 5F
DRY FARMING	W75-11322 5D	ELECTROLYSIS
Estimation of Safe Periods for Crop Planning	***************************************	Physiochemical Treatment of Wastewater-Sea-
Under Dryland Agriculture,	ECOSYSTEMS	water Mixture by Electrolysis,
W75-10926 3F	Environmental Impact Evaluation in Fresh-	W75-10979 5D
	water Impoundments by Vegetation Analysis of	
Improving Productivity in Low Rainfall Areas,	the Terrestrial Ecosystem, W75-10905 2I	Electrolytic Sea Water Process,
in India. W75-11099 3F	W75-10905 2I	W75-11068 3A
W /3-11099	Freshwater Ecosystem Research in Water	Electrolytic Control of Algae,
DRY WELLS	Quality Management,	W75-11228 SF
Special Annulus Fluid Eases Casing Recovery.	W75-11012 6G	
W75-11282 8G	PROV. CORRELATION TECHNIQUE	ELECTROMAGNETIC WAVES
DUAL PURPOSE ENERGY PLANTS	EDDY CORRELATION TECHNIQUE Evapotranspiration of Four Forest Types Mea-	Computer Algorithms Useful for Determining a
Status of Waste Heat Utilization and Dual-Pur-	sured With the Eddy Correlation Technique,	Subsurface Electrical Profile Via High Frequency Probing,
pose Plant Projects,	W75-11044 2D	W75-10910 8G
W75-11251 3E		
	EFFLUENT FEES	EMBRYONIC GROWTH STAGE
DUNES	Simulation of Water Quality Management Poli-	The Effects of Crude Oils and the Dispersant
Studies on the Relationship Between Dry-	cies,	Corexit 8666 on Sea Urchin Gametes and Emb-
Matter Production and the Development of a	W75-11181 5G	ryos, W75-11090 50
Pine Forest on Coastal Sand Dunes (1), (In Japanese),	EFFLUENT GUIDELINES	W75-11090 50
W75-11098 4A	Economic Analysis of Effluent Guidelines:	The Effects of Oil Dispersants on the Cell in
11070	Meat Packing Industry,	Fertilization and Development,
DURSBAN	W75-11249 5G	W75-11091 50
The Effects of Experimental Blackfly (Diptera:	Paramir Ambrid of Perami C. 14 P. T.	ENDEMIC NEPHROPATHY
Simuliidae) Larviciding with Abate, Dursban,	Economic Analysis of Effluent Guidelines. Fer-	Endemic Nephrophathy and Its Relation to the
and Methoxychlor on Stream Invertebrates,	roalloys Industry. W75-11250 5G	Contamination of Well Water by Phenolic
W75-11157 · 5C	W75-11250 5G	Compounds in Barsa-Arad (Nefropatia En
DUWAMISH-GREEN RIVER (WASH)	EFFLUENTS	demica Si Relatia Cu Impurificarea Prin Com
Use of Productivity of Periphyton to Estimate	Design ConsiderationsWater and Effluent	pousi Fenolici in Apele Fintinilor Din Comuni
Water Quality,	Disposal,	Barsa-Arad),
W75-10936 5B	W75-11128 5D	W75-11105 5E

ENERGY	EQUIPMENT	EUTROPHICATION
How Steam is Produced and Handled at the	Pump Selection,	Wastewater Treatment Using Algae and Ar-
Geyers,	W75-11002 8C	temia,
W75-11280 4B		W75-10967 5D
The state of the s	How to Estimate and Escalate Costs of Waste-	
ENERGY DEVELOPMENT	water Equipment,	Preliminary Investigations into Copper Cycling
Impact of Energy Development on the Law of	W75-11014 5D	in Indian Lake, Massachusetts: A Lake Treated
the Colorado River,		Annually with Copper Sulfate,
W75-10869 4C	EQUIPMENT RECOVERY	W75-11039 5B
THE POST OF CARD A	Special Annulus Fluid Eases Casing Recovery.	South African Eutrophication Problems: A Per-
ENERGY SPECTRA	W75-11282 8G	spective,
Turbulent Structure Near Smooth Boundary,		W75-11131 5C
W75-11148 8B	EROSION	***************************************
ENGLAND	Factors Affecting Erosion in a Semi-Arid	Dissolved Organic Matter and Lake Metabol-
The Water Industry in Transition,	Watershed,	ism,
W75-11252 3E	W75-10884 2J	W75-11188 5C
W15-11232 3E	W	
ENVIRONMENTAL EFFECTS	Matagorda Island, Texas: The Evolution of a	Man's Impact on a Newly Formed Reservoir,
Man's Influence on the Hydrological Cycle: A	Gulf Coast Barrier Complex,	W75-11233 5C
Draft Report of the UNESCO/FAO Working	W75-11144 2L	The Economic Impact of Pollution Abatement:
Group on the International Hydrological	Deputation Studies, Con Wa Assume Street	The Case of Water Pollution by Degradable Or-
Decade.	Denudation Studies: Can We Assume Stream	ganic Matter,
W75-10863 2A	Steady State, W75-11154 21	W75-11254 5G
	W75-11154 2J	1175-11254
The Nature and Components of the Hydrologi-	EROSION CONTROL	Natural and Fertilizer Nitrogen in Streams and
cal Cycle,	Shrub Transplanting for Watershed Manage-	Lakes,
W75-10864 2A	ment and Range Improvement in Iran,	W75-11311 5B
An Analysis of the Motor-Row Conversion	W75-10870 4D	EVALUATION
Issue of Colorado River Float Trips,	Stabilization and Reconstruction of Texas	Waste Water Survey, St. Regis Paper Com-
W75-10867 6B	Coastal Foredunes with Vegetation,	pany, Cantonment, Florida.
F	W75-10887 2L	W75-11314 5D
Environmental Impact Evaluation in Fresh-	W 13-10881	EVADODATION
water Impoundments by Vegetation Analysis of	ESTIMATING	EVAPORATION System for Optimal Pressure Control in a
the Terrestrial Ecosystem,	The Measurement and Estimation of Lake	
W75-10905 21	Evaporation from Four Australian Water	Multi-Stage Evaporation Unit, W75-11070 3A
Some Observations on Behavior of the Treated	Storages,	W75-11070 3A
Sewage Disposed in the Sea,	W75-11300 2D	The Measurement and Estimation of Lake
W75-11020 5B	W 75-11300	Evaporation from Four Australian Water
W/3-11020	ESTIMATING EQUATION	Storages,
Strategic Approach to Estuarine Environmental	Approximation for Steady Interface Beneath a	W75-11300 2E
Management,	Well Pumping Fresh Water Overlying Salt	
W75-11179 2L	Water,	EVAPORATION CONTROL
	W75-11255 4B	Wind Effects on Chemical Films for Evapora-
The Effects of the Formation of Lake Kainji	1177	tion Suppression at Lake Hefner,
(Nigeria) Upon the Indigenous Fish Population,	ESTUARIES	W75-10920 3E
W75-11223 5C	A Three-Dimensional Model for Estuaries and	THE PARTY IN COLUMN 1 THE CALL
	Coastal Seas: Vol. II, Aspects of Computation,	EVAPOTRANSPIRATION
An Economic Analysis of the Pollution	W75-10900 2L	Evapotranspiration of Four Forest Types Mea
Problems in the Colorado River Basin: The		sured With the Eddy Correlation Technique, W75-11044
Upper Main Stem Sub-Basin,	Behavior of Mn, Fe, Cu, Zn, Cd and Pb	W75-11044 2I
W75-11247 5G	Discharged from a Wastewater Treatment Plant	EVAPOTRANSPIRATION CONTROL
0.11.0	into an Estuarine Environment,	An Appraisal of Potential Water Salvage in the
Guidelines for the Identification of Potential	W75-11160 5B	Lake McMillen Delta Area, Eddy County, New
Environmental Impacts in the Construction and		Mexico,
Operation of a Reservoir,	Strategic Approach to Estuarine Environmental	W75-10941 31
W75-11316 SC	Management,	
ENVIRONMENTAL ENGINEERING	W75-11179 2L	EVOLUTION
Simulation of Water Quality Management Poli-		Matagorda Island, Texas: The Evolution of
	A Survey of Fishes and Commercial Inver-	Gulf Coast Barrier Complex,
cies, W75-11181 5G	tebrates of the Nearshore and Estuarine Zone	W75-11144 21
30	Between Cape Romano and Cape Sable,	PVCBETION
ENVIRONMENTAL SANITATION	Florida,	EXCRETION Charles Faceting in Tax
The Impact of the Safe Drinking Water Act on	W75-11189 21	An Investigation of Glycolate Excretion in Two
Utilities,	PUBACIAN WATER ME TOUT	Species of Blue-Green Algae, W75-11230 50
W75-10859 5G	EURASIAN WATER MILFOIL	W75-11230 50
30	Biological Control of Eurasian Water Milfoil,	EXPLORATION
Pitless Adapters: Emphasis on Sanitation,	W75-11203 4A	Making Log Analysts of Geologists.
W75-11258 8C	FUNORE	W75-11288 76
	EUROPE	
EPIDEMICS	A General Description of the Oligotrophic Lake	Subsurface Water Tool for Petroleum Ex
A Waterborne Gastroenteritis Epidemic in Pico	Paajarvi, Southern Finland, and the Ecological	ploration,
Rivers, California,	Studies on It,	W75-11289 41
W75-11005 5F	W75-11229 5C	
DRIVE	PUDVIEWODA A PEINIC	How Downhole Temperatures, Pressures Af
EPIFAUNAL INVERTEBRATES	EURYTEMORA AFFINIS	fect Drilling; Part 8: Needless Spending of
Epifaunal Invertebrates as Indicators of Water	Adaptation of Copepod Populations to Thermal	Drilling and Exploration Money Can Be Pro
Quality in Southern Lake Pontchartain,	Stress,	dicted-And Prevented,
W75-10852 5C	W75-11046 5C	W75-11298 86

21

5D

5D

5D

Process for Treating Industrial Wastes,

Flocculation Device for Waste Fluid Treat-

St fo Pa lis po W

FLO

Re FI W

FLO A the W

sis W

FLO Flo

Pre

FLO

Pre

tur W FLO

wa

FLO

Co

hya W7

Ope W7

Wa pan W7

FLOR

Rec

Sen W7

FLOT

FAILURE (MECHANICS)		
FAILURE (MECHANICS)	(Aufbereitungsversuche an einem stark humin-	FISH EGGS
The Mechanics of Rock Failure Due to Water	stoffbelasteten Tiefengrundwasser),	The Effects of Oil Dispersants on the Cell in
Jet Impingement,	W75-11117 5D	Fertilization and Development,
W75-11272 8E	W.5-1111	W75-11091 5C
W/3-112/2	Can a Computer Really Operate a Water-Filtra-	W/3-11091
FALLOUT	tion Plant,	Effects of Ozone-Treated Seawater on the
A Field Study of Physico-Chemical States of	W75-11184 5F	Spawned, Fertilized, Meiotic, and Cleaving
Artificial Radionuclides in Seawater,		Eggs of the Commercial American Oyster,
W75-11022 5B	Vacuum Distillation/Vapor Filtration Water	W75-11256 5C
	Recovery,	
FARM MANAGEMENT	W75-11315 5D	FISH MANAGEMENT
Improving Productivity in Low Rainfall Areas,	FINANCING	Experimentally Increased Fish Stock in the
in India.	Upgrading Meat Packing Facilities to Reduce	Pond Type Lake Warniak. IV. Feeding of In-
W75-11099 3F	Pollution. (Part 3). Choosing the Optimum	troduced and Autochthonous Non-Predatory
TARRES DE LA PRINCIPA DEL PRINCIPA DEL LA PRINCIPA DEL PRINCIPA DE LA PRINCIPA DE	Financial Strategy,	Fish,
FATHEAD MINNOWS	W75-11322 5D	W75-11234 5C
Toxaphene Effects on Growth and Bone Com-	W15-11522	PIGH BHILICIO OCT
position of Fathead Minnows, Pimephales	FINITE DIFFERENCES	FISH PHYSIOLOGY
Promelas,	A Three-Dimensional Model for Estuaries and	Effect of DDT and M.S. 222 on Learning a
W75-11026 5C	Coastal Seas: Vol. II, Aspects of Computation,	Simple Conditioned Response in Rainbow
FEASIBILITY STUDIES	W75-10900 2L	Trout (Salmo gairdneri),
Tests Show Potassium Mud Versatility,		W75-11025 5C
	Wave Motion in Rockfill,	Toxaphene Effects on Growth and Bone Com-
W75-11284 8G	W75-10924 8D	position of Fathead Minnows, Pimephales
FEDERAL JURISDICTION	PRESIDENT THE TIME THE PROPERTY AND A STATE STORY	Promelas,
Milestone Water Legislation Accompanied by	FINITE ELEMENT ANALYSIS	W75-11026 5C
Millstone of Bureaucratic Red Tape.	Management of Retardation of Salt Water In-	1175-11020
W75-11007 5G	trusion in Coastal Aquifers,	Studies on Toxicity of Sodium Nifurstyrenate
1172 11001	W75-11058 2F	(NFS-NA) in Cultured Yellowtail (In
FEDERAL WATER POLLUTION CONTROL	Finite-Element Method for Water-Distribution	Japanese),
ACT	Networks.	W75-11034 5C
Information as a Regulatory Tool in Water	W75-11186 4A	
Quality Control,	W/2-11100	The Effects of Oil Dispersants on the Cell in
W75-10903 5G	FINLAND	Fertilization and Development,
	Study of Electrochemical Treatment Method	W75-11091 5C
Cost Sharing to Help Clean Our Waterways.	for Removing Colloidal Particles from Pulp and	PIOU BORUL ATTANC
W75-11023 5G	Paper Industry Effluents (Tutkimus selluteol-	FISH POPULATIONS
ETHINAL COLLECTION	lisuuden jatevesien kolloidaalisten ainesten	The Effects of the Formation of Lake Kainji
FEHLMANN COLLECTOR	poistomahdollisuudesta sahkokemialliesti),	(Nigeria) Upon the Indigenous Fish Population,
Induced Infiltration Supply System Among Big-	W75-11348 5D	W75-11223 5C
gest.	Provi	FISH REPRODUCTION
W75-11010 5F	FISH	Unisex Studies on the White Amur,
FERROALLOYS INDUSTRY	Studies on Toxicity of Sodium Nifurstyrenate	W75-11205 5C
Economic Analysis of Effluent Guidelines. Fer-	(NFS-NA) in Cultured Yellowtail (In	1175-11205
roalloys Industry.	Japanesc), W75-11034 5C	FISH STERILANTS
W75-11250 5G	W 75-11034 SC	Unisex Studies on the White Amur,
0.0000	The Toxicity of Drilling Fluid Components to	W75-11205 5C
FERTILIZATION	Aquatic Biological Systems, A Literature	
The Effects of Oil Dispersants on the Cell in	Review,	FISH STOCKING
Fertilization and Development,	W75-11266 SC	Experimentally Increased Fish Stock in the
W75-11091 5C		Pond Type Lake Warniak. IV. Feeding of In-
P#	Quantitative Estimation of the Daily Ingestion	troduced and Autochthonous Non-Predatory
Effects of Ozone-Treated Seawater on the	of Phytoplankton by Tilapia Nilotica and	Fish,
Spawned, Fertilized, Meiotic, and Cleaving	Haplochromis Nigripinnis in Lake George,	W75-11234 5C
Eggs of the Commercial American Oyster,	Uganda,	PICHEDIEC
W75-11256 5C	W75-11268 2H	FISHERIES
FERTUIZERS	Effluent Characteristics and Treatment of	Limnology of Desert Ponds, W75-10880 2H
Fertilizer Phosphate in Streams and Lakes,	Mechanical Pulping Effluents,	W /3-10000 2H
W75-11310 5B	W75-11331 5D	A Survey of Fishes and Commercial Inver-
750	30	tebrates of the Nearshore and Estuarine Zone
Natural and Fertilizer Nitrogen in Streams and	FISH BEHAVIOR	Between Cape Romano and Cape Sable,
Lakes,	Effect of DDT and M.S. 222 on Learning a	Florida,
W75-11311 5B	Simple Conditioned Response in Rainbow	W75-11189 21
	Trout (Salmo gairdneri),	
FILMS	W75-11025 SC	FLOCCULATION
Wind Effects on Chemical Films for Evapora-	FIGH DIFTS	The Mechanism of Flocculation Processes in
tion Suppression at Lake Hefner,	FISH DIETS	the Presence of Humic Stubtances,
W75-10920 3B	Experimentally Increased Fish Stock in the	W75-10958 5D
FILTERS	Pond Type Lake Warniak. IV. Feeding of In-	Process for Transitive Industrial Warner
Pilot-Plant Study of Denitrification Using a	troduced and Autochthonous Non-Predatory Fish,	Process for Treating Industrial Wastes, W75-11066 5D
Submerged Sand Filter at Rye Meads Sewage	W75-11234 5C	W 7.5-11000

FISH DISEASES

Japanese),

W75-11034

Studies on Toxicity of Sodium Nifurstyrenate

(NFS-NA) in Cultured Yellowtail (In

5D

5C

W75-11067

ment, W75-11077

Works,

W75-10955

Submerged Sand Filter at Rye Meads Sewage

Treatment Methods of Groundwater Containing a Large Quantity of Humic Acid

Optimum Values for Operational Variables in	Treating Effluents from a Sulphite Pulp Mill by	Upgrading Meat Packing Facilities to Reduce
Turbidity Removal,	Flotation,	Pollution. (Part 2). Waste Treatment,
W75-11110 5D	W75-11347 5D	W75-11321 5D
Treating Effluents from a Sulphite Pulp Mill by Flotation,	FLOW Formulation of Boundary Conditions at the	Upgrading Meat Packing Facilities to Reduce Pollution. (Part 3). Choosing the Optimum
W75-11347 5D	Surface of a Porous Medium,	Financial Strategy,
Study of Electrochemical Treatment Method	W75-11269 8B	W75-11322 5D
for Removing Colloidal Particles from Pulp and	Analysis of Factors Influencing Mobility and	Upgrading Poultry-Processing Facilities to
Paper Industry Effluents (Tutkimus selluteol-	Adsorption in the Flow of Polymer Solution	Reduce Pollution. (Part 1). In-Process Pollution
lisuuden jatevesien kolloidaalisten ainesten	Through Porous Media,	Abatement, W75-11328 5E
poistomahdollisuudesta sahkokemialliesti), W75-11348 5D	W75-11275 8B	W/3-11328
	Theory of Plasticity of Porous Media with	Upgrading Poultry-Processing Facilities to
FLOOD FREQUENCY	Fluid Flow,	Reduce Pollution. (Part 2). Pretreatment of Poultry-Processing Wastes,
Relative Importance of Decision Variables in Flood Frequency Analysis.	W75-11276 8E	W75-11329 5E
W75-10929 4A	FLOW AROUND OBJECTS	Unandia Barba Barraia Callida A
FLOOD PLAIN INSURANCE	Cavitation Control by Aeration of High-	Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 3). Waste Treatment.
A Case Study of Some Economic Aspects of	Velocity Jets, W75-11152 8B	W75-11330 5E
the National Flood Insurance Program,	W75-11152 8B	FORECASTING
W75-10906 6F	FLOW CHARACTERISTICS	Predicting Cavitation in Sudden Enlargements,
The Economics of Flood Insurance: An Analy-	Some Results on Mass Transfer Processes in a Density-Stratified Flow,	W75-11151 8E
sis of the National Flood Insurance Program,	W75-11057 8B	Some Observations on Rainfall in Western
W75-11038 6F		New South Wales,
FLOOD PLAIN ZONING	Turbulent Structure Near Smooth Boundary, W75-11148 8B	W75-11304 2E
Floodplain Land-Use Management: An Appli-	W75-11148 8B	FOREIGN COUNTRIES
cation of Operations Research Methodology,	FLOW MEASUREMENT	Translations on Environmental Quality, No. 33.
W75-11037 6F	Difficulties in Gauging Small Catchments - A	W75-11246 50
Prescriptive Economic Models for Nonstruc-	Case Study, W75-11306 2E	FOREST MANAGEMENT GUIDELINES
tural Flood Control,		An Assessment of Snowpack Depletion-Sur
W75-11060 6F	FLOW NETS	face Runoff Relationships on Forestee Watersheds,
FLOOD PLAINS	Application of Electrical Analogy to Draw Flow Nets for Sudden Drawdown Conditions in	W75-11049 4A
Prescriptive Economic Models for Nonstruc-	Earth Dams,	FOREST WATERSHEDS
tural Flood Control, W75-11060 6F	W75-11143 8B	An Assessment of Snowpack Depletion-Sur
	FLOW RATES	face Runoff Relationships on Forestee
FLOODWATER	Nozzle Hydraulics in the Trickle Irrigation	Watersheds,
Environmental Impact Evaluation in Fresh- water Impoundments by Vegetation Analysis of	SystemRelation Between Water Temperature	W75-11049 4A
the Terrestrial Ecosystem,	and Nozzle Flow Rate (In Japanese), W75-11096 3F	Moisture and Energy Conditions in a Draining
W75-10905 21	W 75-11050	Soil Mass, W75-11054 20
FLORIDA	FLOW-THROUGH SYSTEMS	
Recharge Areas of the Floridan Aquifer in	Continuous Automatic Monitoring of Surface Water with Fish,	FORESTS
Seminole County and Vicinity, Florida,	W75-11079 5A	Vegetation, Soil, and Climate on the Green Mountains of Vermont,
W75-10944 7C	PLUADIDE	W75-11021 2
Comparison of Uredo Eichhorniae, the Water-	FLUORIDES Interference of Sulfate Ion on SPADNS	Evapotranspiration of Four Forest Types Mea
hyacinth Rust, and Uromyces Pontederiae,	(Sodium 2-(Sulfophenylazo)-1,8-Dihydrox-	sured With the Eddy Correlation Technique,
W75-11092 5G	ynaphthalene-3,6-Disulfonate) Colorimetric	W75-11044 2I
A Survey of Fishes and Commercial Inver-	Determination of Fluorine in Waste Waters, W75-11343 5A	FORMALDEHYDE
Between Cape Romano and Cape Sable,	W/5-11545	Preserving Activated Sludge,
Florida.	FLY ASH	W75-10962 SI
W75-11189 2I	Evaluation of the Adsorptive Properties of Fly Ash with Reference to a Pulp and Paper Mill	FORMATION PRESSURE
Operation Clean Sweep,	Waste Effluent,	How to Find Transition Zones in Soft Forma
W75-11192 5G	W75-11335 5D	tions, W75-11285
	FOOD CHAINS	
Aquatic Plant Research and Control in Florida, W75-11195	Biomagnification of Dieldrin Residues by Food	How Downhole Temperatures, Pressures Af fect Drilling; Part 4: Pitfalls in Overpressure
A STATE OF THE PARTY OF THE PARTY OF	Chain Transfer from Clams to Blue Crabs	Prediction,
Waste Water Survey, St. Regis Paper Com- pany, Cantonment, Florida.	Under Controllled Conditions, W75-11135 5C	W75-11294 80
W75-11314 5D		FRICTION
	FOOD PROCESSING INDUSTRY	Effects of Entrance Loss on Harbor Oscilla
Recharge Areas of the Floridan Aquifer in	Economic Analysis of Effluent Guidelines: Meat Packing Industry,	tions,
Seminole County and Vicinity, Florida,	W75-11249 5G	W75-11147
W75-10944 7C		FUCUS VESICULOSUS
FLOTATION	Upgrading Meat Packing Facilities to Reduce Pollution. (Part 1). In-Process Modifications	The Accumulation of Cadmium, Copper, Man ganese and Zinc by Fucus Vesiculosus in th
Algae Removal Using Dissolved Air Flotation,	and Pretreatment,	Bristol Channel,
W75-10978 5D	W75-11320 5D	W75-11083 51

Stud timu Grou W75

Trea a (Auf stoff W75-

Depr fects W75-

Uran Sedir W75-

Solid Resid Water W75-

Probl W75-

Grou Probl W75-

Substitution of the substi

GROUN Recha Semin W75-1

GROUN Estim Water Santa W75-1

Groun Centra W75-1

Recha Semin W75-1

Horizo and De W75-10

Horizo Larges W75-10

GROWT Toxapl positio Promel W75-11

FULVIC ACIDS

FULVIC ACIDS	GEOLOGY	GRASSES
Chelation Study of Copper (II): Fulvic Acid	Review of Conference on Hydrology of Deep	The Early Vegetative Growth of Two Annual
System,	Sedimentary Basins,	Pasture Grasses (Hordeum Leporinum Link
W75-11219 5B	W75-10935 5B	and Lolium Rigidum Gaud.),
	35	W75-10876 3F
FUNGI	Sediment Processes in Great Lakes,	
Phytophthora Species in Arizona: Its Occur-	W75-11237 2J	Establishing Alkali Sacaton on Harsh Sites in
rence in Recycled Irrigation water,		the Southwest,
W75-10883 5A	GEOPHYSICS	W75-10882 4A
	Computer Algorithms Useful for Determining a	1172 10000
GAGING STATIONS		Water Consumption and Water Turnover of
Difficulties in Gauging Small Catchments - A	Subsurface Electrical Profile Via High	Sheep Grazing Semiarid Pasture Communities
Case Study,	Frequency Probing,	in New South Wales,
	W75-10910 8G	
W75-11306 2E		W75-10888 3F
Aspects of Rainfall Measurement in a New En-	GEORGIA	The Influence of Density and Nitrogen on the
	Unisex Studies on the White Amur,	
gland Location,	W75-11205 5C	Outcome of Competition Between Two Annual
W75-11309 2B		Pasture Grasses (Hordeum Leporinum Link
GAMETES	GEOSMIN	and Lolium Rigidum Gaud.),
	Biological Control: Isolation and Bacterial Ox-	W75-10889 3F
The Effects of Crude Oils and the Dispersant	idation of the Taste-and-Odor Compound	
Corexit 8666 on Sea Urchin Gametes and Emb-	Geosmin,	The Germination and Establishment of Two
ryos,	W75-11013 . 5F	Annual Pasture Grasses (Hordeum Leporinum
W75-11090 5C		Link and Lolium Rigidum Gaud.),
	GEOTHERMAL ENERGY	W75-10897 21
The Effects of Oil Dispersants on the Cell in	How Steam is Produced and Handled at the	
Fertilization and Development,		Transplanting Sea Grass in Mississippi Sound,
W75-11091 5C	Geyers,	W75-11207 4A
	W75-11280 4B	
GAS	CROSSESSALV CONTRACT	GRASSLANDS
How Downhole Temperatures, Pressures Af-	GEOTHERMAL STUDIES	Seasonal Variation in Composition, Plant
fect Drilling; Part 6: Correlating Geopressure	How Steam is Produced and Handled at the	Biomass, and Net Primary Productivity of a
Gradients with Hydrocarbon Accumulations,	Geyers,	Tropical Grassland at Kurukshetra, India,
W75-11296 8G	W75-11280 4B	
113-11270		W75-11006 2I
How Downhole Temperatures, Pressures Af-	GERMANY (HAMBURG-CURSLACK)	GRAZING
fect Drilling; Part 8: Needless Spending of	Treatment Methods of Groundwater Containing	
Drilling and Exploration Money Can Be Pre-	a Large Quantity of Humic Acid	Salt and Specific Ion Effects on Germination of
	(Aufbereitungsversuche an einem stark humin-	Four Grasses,
dicted-And Prevented	stoffbelasteten Tiefengrundwasser),	W75-10894 2K
W75-11298 8G		
GAS CHROMATOGRAPHY	W75-11117 5D	GREAT LAKES
	CERMINATION	Primary Production in Lakes Ontario and Erie:
Chromatographic Determination of Phenols in	GERMINATION	A Comparative Study,
Water,	The Early Vegetative Growth of Two Annual	W75-11217 5C
W75-11344 5A	Pasture Grasses (Hordeum Leporinum Link	
G. 600	and Lolium Rigidum Gaud.),	Sediment Processes in Great Lakes,
GASES	W75-10876 3F	W75-11237 2J
Dissolved Gas Supersaturation and Dilution in		
Thermal Plumes from Steam Electric Generat-	Establishing Alkali Sacaton on Harsh Sites in	Preliminary Information on the Nature of Or-
ing Stations,	the Southwest,	ganic Matter in the Surface Sediments of Lakes
W75-11159 5B	W75-10882 4A	Huron, Erie, and Ontario,
		W75-11240 2J
GASTROPODS	The Germination and Establishment of Two	1175-11240
Copper Toxicity in Busycon Canaliculatum L.,	Annual Pasture Grasses (Hordeum Leporinum	Economics of Great Lakes Shipping in an Ex-
W75-11031 5C	Link and Lolium Rigidum Gaud.),	tended Season,
	W75-10897 2I	W75-11248 6C
GEOCHEMISTRY	11/2/1007/	W 73-11248
Geochemical Reconaissance of Surficial	GLACIAL SEDIMENTS	GREEN MOUNTAINS (VT)
Materials in the Vicinity of Shawangunk Moun-	Weyl's Theory of Glaciation Supported by	
tain. New York.	Isotopic Study of Norwegian Core K 11,	Vegetation, Soil, and Climate on the Green
W75-10928 5A		Mountains of Vermont,
211	W75-11153 2J	W75-11021 21
GEOLOGIC MAPPING	CLACIEDE	OPERATOR N. GALLOO
Contour Map of the Bedrock Surface, New	GLACIERS	GREENFIELD (MASS)
Britain Quadrangle, Connecticut,	Weyl's Theory of Glaciation Supported by	Map Showing Depth to Bedrock, Greenfield
W75-10950 7C	Isotopic Study of Norwegian Core K 11,	Quadrangle, Massachusetts,
W 13-10930	W75-11153 2J	W75-10952 7C
Map Showing Depth to Bedrock, Worthington		
Quadrangle, Massachusetts,	GLYCOLIC ACID	GREENHOUSES
	An Investigation of Glycolate Excretion in Two	Cultivation of Netted Melon By Use of Trickle
W75-10951 7C	Species of Blue-Green Algae,	Irrigation in a Sand Field Plastic Greenhouse,
Map Showing Depth to Bedrock, Greenfield	W75-11230 5C	(In Japanese),
		W75-11095 3F
Quadrangle, Massachusetts,	GOLDFISH	
W75-10952 7C	Absorption and Elimination of Photodieldrin by	GROUNDWATER
Mon Showing Donth to Dadrock Charter	Daphnia and Goldfish,	Quality of Water in Aquifers of the Amargosa
Map Showing Depth to Bedrock, Chester	W75-11085 5B	
Quadrangle, Massachusetts,	113-11003 3B	Desert and Vicinity, Nevada, W75-10932 5B
W75-10953 7C	GOPHER SNAKES	W75-10932 5B
Man Chamber Donah / D. L. L. W C		How Cilian Affacts I Down I from
Map Showing Depth to Bedrock, Mount Car-	The Use of Snakes as a Pollution Indicator	How Silica Affects Iron Removal from
mel Quandrangle, Connecticut,	Species,	Groundwater,
W75-10954 7C	W75-11089 5B	W75-11016 5F

Study of Criteria and Models Establishing Op-	Survival and Growth Rate of Channel Catfish	HEAT TRANSFER
mum Level of Hydrogeologic Information for	as a Function of Dissolved-Oxygen Concentra-	Status of Waste Heat Utilization and Dual-Pur-
Groundwater Basin Management, W75-11042 2F	tion,	pose Plant Projects,
V/3-11042 2F	W75-11051 5C	W75-11251 3E
reatment Methods of Groundwater Containing	Studies on the Relationship Between Dry-	HEATED WATER
Large Quantity of Humic Acid	Matter Production and the Development of a	Status of Waste Heat Utilization and Dual-Pur-
Aufbereitungsversuche an einem stark humin-	Pine Forest on Coastal Sand Dunes (1), (In	pose Plant Projects,
stoffbelasteten Tiefengrundwasser),	Japanese),	W75-11251 3E
W75-11117 5D	W75-11098 4A	
Deprivation Contribution and Interference Ef-		HEATING
fects of Multiple Wells in a Common Aquifer,	A Contribution to the Biology of Nitella	Status of Waste Heat Utilization and Dual-Pur-
W75-11142 4B	Hookeri A. BR. in the Rotorua Lakes, New	pose Plant Projects,
	Zealand. II. Organic Nutrients and Physical	W75-11251 3E
Uranium Mineralization by Ground Water in	Factors,	*******************
Sedimentary Rocks, Japan.	W75-11235 5C	HEAVY METALS
W75-11145 2F	The Kinetics of Crystallization of Scale-Form-	Geochemical Reconaissance of Surficial
Solid Wastes, Animal Refuse, and Organic	ing Minerals,	Materials in the Vicinity of Shawangunk Moun-
Residues Disposal, and the Quality of Ground	W75-11273 8G	tain, New York, W75-10928 5A
Water,	117511275	W 13-10928 3A
W75-11244 5B	GROWTH STAGES	Heavy Metals and Other Trace Elements,
36	A Reevaluation of the Combined Effects of	W75-10934 5B
Colorado City Solves Its Sand Pumping	Temperature and Salinity on Survival and	
Problems,	Growth of Bivalve Larvae Using Response	Mercury Content of Whales, (In Japanese),
W75-11261 8C	Surface Techniques,	W75-11029 5B
Caral Water Darley and Chris	W75-11081 5C	
Ground Water Depletion and Subsidence		Interactions of Heavy Metals in the Activated
Problems in Taipei Basin, W75-11262 4B	Standard Curves for Nuvacron, Malathion,	Sludge Process,
W75-11262 4B	Sevin, DDT, and Kelthane Tested Against the	W75-11173 5D
Subsurface Water Tool for Petroleum Ex-	Mosquito Culex Pipiens L. and the	HELE-SHAW MODEL
ploration,	Microcrustacean Daphnia Magna Straus,	
W75-11289 4B	W75-11082 5B	Approximation for Steady Interface Beneath a
	The Difference of Courts Oils and the Discourse	Well Pumping Fresh Water Overlying Salt Water,
A Practical Way to Find Minimum Drainage	The Effects of Crude Oils and the Dispersant	W75-11255 4B
Area for a Well,	Corexit 8666 on Sea Urchin Gametes and Emb- ryos,	40
W75-11290 4B	W75-11090 5C	HERBICIDE REGISTRATION
GROUNDWATER MINING	30	Registration of Herbicides for Aquatic Use,
Deprivation Contribution and Interference Ef-	GULF OF MEXICO	W75-11197 5G
fects of Multiple Wells in a Common Aquifer,	Matagorda Island, Texas: The Evolution of a	
W75-11142 4B	Gulf Coast Barrier Complex,	HERBICIDES
POUNDWATER MOVEMENT	W75-11144 2L	Occurrence of 2, 4, 5-T and Picloram in Sur-
BROUNDWATER MOVEMENT	CHAOCENEGIC	face Runoff Water in the Blacklands of Texas, W75-10895 5B
Determination of Regional Hydraulic Conduc- tivity Through Use of C-14 Dating of Ground-	GYNOGENESIS	W75-10895 5B
water,	Unisex Studies on the White Amur,	Cost Evaluation of Watercourse Management
W75-10930 2F	W75-11205 5C	in Essex,
	HALOGENATED PESTICIDES	W75-11008 5G
GROUNDWATER RECHARGE	Toxaphene Effects on Growth and Bone Com-	
Recharge Areas of the Floridan Aquifer in	position of Fathead Minnows, Pimephales	Operation Clean Sweep,
Seminole County and Vicinity, Florida,	Promelas,	W75-11192 5G
W75-10944 7C	W75-11026 5C	Field Tests of Slow-Release Herbicides,
GROUNDWATER RESOURCES		
Estimated Availability of Surface and Ground	HAPLOCHROMIS-NIGRIPINNIS	W75-11193
Water in the Pojoaque River Drainage Basin,	Quantitative Estimation of the Daily Ingestion	Aquatic Plant Control on Lake Corpus Christi,
Santa Fe County, New Mexico,	of Phytoplankton by Tilapia Nilotica and	W75-11194 5C
W75-10938 4A	Haplochromis Nigripinnis in Lake George,	
C-1 W - 1 - 1 - C - W - 1 - 1	Uganda,	Registration of Herbicides for Aquatic Use,
Ground Water in the Corvallis-Albany Area,	W75-11268 2H	W75-11197 50
Central Willamette Valley, Oregon,	HARBORS	Ct. 1.10 . 1.15
W75-10940 2F	Effects of Entrance Loss on Harbor Oscilla-	Chemical Control of Egeria Densa,
Recharge Areas of the Floridan Aquifer in	tions,	W75-11199 50
Seminole County and Vicinity, Florida,	W75-11147 8B	Field Testing of Aquatic Herbicides for Contro
W75-10944 7C	ов	of Egeria Densa,
	Strategic Approach to Estuarine Environmental	W75-11200 50
Horizontal Groundwater Collectors, Hydraulics	Management,	
and Design,	W75-11179 2L	Aquatic Plant Control Using Herbicides in
W75-10998 8B		Large Potable Water Supply,
Horizontal Groundwater Collectors, 'Canada's	HAWAII	W75-11201 50
Largest Water Well'.	Nitrogen Removal in the Operation of the	
W75-10999 8B	Mililani Sewage Treatment Plant,	Herbicide Chemicals and Their Effect on the
	W75-11041 5D	Aquatic Environment,
GROWTH RATES	HEAT EVOLUNCERS	W75-11211 50
Toxaphene Effects on Growth and Bone Com-	HEAT EXCHANGERS	Dissination of Phonous Weshielder 4 - 12 4
position of Fathead Minnows, Pimephales	System for Optimal Pressure Control in a	Dissipation of Phenoxy Herbicides Applied to
Promelas,	Multi-Stage Evaporation Unit, W75-11070 3A	Riparian Vegetation, W75-11214 5E
W75-11026 5C	W75-11070 3A	W75-11214 5E

J

c

n 21

ld

C

de

se, 3F

osa

5B om

5F

HERBIVORES

HERBIVORES	HUMUS	HYDROGEN PEROXIDE
The Influence of Rainfall on the Reproduction	A General Description of the Oligotrophic Lake	Oxidation of Organic Compounds in Water
of Sonoran Desert Lagomorphs,	Paajarvi, Southern Finland, and the Ecological	(Oxidation organischer Verbindungen in
W75-10871 4A	Studies on It, W75-11229 5C	Wasser), W75-11118 5D
HIGH-FREQUENCY PROBING	W 75-11229 SC	W75-11116
Computer Algorithms Useful for Determining a	Preliminary Information on the Nature of Or-	HYDROGEN SULFIDE
Subsurface Electrical Profile Via High Frequency Probing,	ganic Matter in the Surface Sediments of Lakes Huron, Erie, and Ontario,	Factors Influencing Acute Toxicity Estimates of Hydrogen Sulfide to Freshwater Inver-
W75-10910 8G	W75-11240 2J	tebrates,
HIGH PRESSURE	Changes in Vegetation and Surface Soil Proper-	W75-11027 5C
How Downhole Temperatures, Pressures Af- fect Drilling; Part 4: Pitfalls in Overpressure	ties Following Irrigation of Woodlands with Municipal Wastewater,	Dissolved Gases Are Key Corrosion Culprits, W75-11274 8G
Prediction,	W75-11243 . 5B	
W75-11294 8G		HYDROGEOLOGY
	HUNGARY	Hydrogeology and Water Resources of Middle
How Downhole Temperatures, Pressures Af- fect Drilling; Part 5: Predicting Hydrocarbon	Papermaking Complex at Dunaujvaros (Hungary) Preserving the Danube (Au com-	Kirkland Creek Basin, Yavapai County, Arizona, W75-10872 4B
Environments with Wireline Data, W75-11295 8G	plexe papetier de Dunaujvaros preserver le Danube),	
	W75-11333 5D	Ground Water in the Corvallis-Albany Area,
How Downhole Temperatures, Pressures Af-		Central Willamette Valley, Oregon, W75-10940 2F
fect Drilling; Part 7: The Shale Resistivity Ratio	HYDRAULIC CONDUCTIVITY	W75-10940
- A Valuable Tool for Making Economic Drilling Decisions,	Determination of Regional Hydraulic Conduc- tivity Through Use of C-14 Dating of Ground-	HYDROGRAPHS Prodicting Passessions Through Convolution
W75-11297 8G	water,	Predicting Recessions Through Convolution, W75-10917 2E
How Downhole Temperatures, Pressures Af-	W75-10930 2F	
fect Drilling; Part 8: Needless Spending of	HYDRAULIC EQUIPMENT	HYDROLOGIC ASPECTS Balancing the Effects of Man's Actions on the
Drilling and Exploration Money Can Be Pre-	Sprinkler Irrigation Practice, (La Pratique De	Hydrological Cycle,
dicted-And Prevented,	L'Irrigation Par Aspersion),	W75-10865 2A
W75-11298 8G	W75-10875 3F	HYDROLOGIC CYCLE
HIGH PRESSURE GRADIENTS	A Pneumatic System to Pump Water from	Man's Influence on the Hydrological Cycle: A
How Downhole Temperatures, Pressures Af-	Piezometers,	Draft Report of the UNESCO/FAO Working
fect Drilling; Part 8: Needless Spending of	W75-11257 8C	Group on the International Hydrological
Drilling and Exploration Money Can Be Pre-	HYDRAULIC FORCES METHOD	Decade.
dicted-And Prevented,	Management of Retardation of Salt Water In-	W75-10863 2A
W75-11298 8G	trusion in Coastal Aquifers,	The Nature and Components of the Hydrologi-
HILLSIDE DRAINAGE	W75-11058 2F	cal Cycle,
Moisture and Energy Conditions in a Draining		W75-10864 2A
Soil Mass,	HYDRAULIC MINING	D. L. vice de Fiffe de «CM-» à Astiens en de
W75-11054 2G	The Mechanics of Rock Failure Due to Water Jet Impingement,	Balancing the Effects of Man's Actions on the Hydrological Cycle,
HORIZONTAL GROUNDWATER COLLECTOR	W75-11272 8E	W75-10865 2A
Horizontal Groundwater Collectors, Hydraulics	11.0-112.2	
and Design,	HYDRAULIC MODELS	Human Obstacles to the Control of the
W75-10998 8B	Implicit Numerical Modeling of Unsteady	Hydrological Cycle for the Benefit of Man, W75-10866 2A
HORIZONTAL GROUNDWATER	Flows, W75-10925 8B	W / 5-10000
COLLECTORS	W 75-10923	The Hydrologic CycleAs Applicable to the
Horizontal Groundwater Collectors, 'Canada's	Hydraulic Modeling of Mixing Phenomena in	Pacific Northwest,
Largest Water Well',	Stratified Lakes,	W75-10949 7C
W75-10999 8B	W75-11043 2H	HYDROLOGIC DATA
HOT SPRINGS	Cavitation Control by Aeration of High-	Man's Influence on the Hydrological Cycle: A
The Minor and Trace Elements, Gas, and	Velocity Jets.	Draft Report of the UNESCO/FAO Working
Isotope Compositions of the Principal Hot	W75-11152 8B	Group on the International Hydrological
Springs of Nevada and Oregon,	HILIDO A KIT KOO	Decade. W75-10863 2A
W75-10937 2K	HYDRAULICS Predicting Cavitation in Sudden Enlargements,	W /3-10803
HOURLY	W75-11151 8B	The Nature and Components of the Hydrologi-
Automated Hourly Computations,	W15-11151	cal Cycle,
W75-10915 7C	HYDROCARBONS	W75-10864 2A
	How Downhole Temperatures, Pressures Af-	Description of Card and Tape Formats for Sup-
HUMIC ACIDS	fect Drilling; Part 6: Correlating Geopressure	plying Data to Users.
Treatment Methods of Groundwater Containing a Large Quantity of Humic Acid	Gradients with Hydrocarbon Accumulations, W75-11296 8G	W75-10914 7C
a Large Quantity of Humic Acid (Aufbereitungsversuche an einem stark humin-	W 75-11250	Streamflow in the New York Part of the
stoffbelasteten Tiefengrundwasser),	HYDROGEN	Susquehanna River Basin,
W75-11117 5D	Measures of Biodegradability and Refractory	W75-10931 2E
Chelation Study of Copper (II): Fulvic Acid	Organics in Wastewaters: (Analysis, Interpreta- tion, and Application of Measurement	Estimated Availability of Surface and Count
System,	Techniques),	Estimated Availability of Surface and Ground Water in the Pojoaque River Drainage Basin,
W75-11219 · 5B	W75-11103 5D	Santa Fe County, New Mexico,
		W75-10938 4A
HUMID CLIMATES	HYDROGEN ION CONCENTRATION	0-1W-10 0 W 10
Scheduling and Application Rates of Irrigation in a Humid Climate.	Relations Between Algal Populations and the pH of Their Media,	Ground Water in the Corvallis-Albany Area, Central Willamette Valley, Oregon,
W75-11048 3F	W75-11028 5C	W75-10940 2F
31		-

н

н

H

IC

ID

INCO PRO INC

Water Resources of the Lower St. Croix River	INDIA (KURUKSHETRA)	INFILTRATION
Watershed, East-Central Minnesota,	Seasonal Variation in Composition, Plant	Barrenness of Desert Pavement in Yuma Coun-
W75-10945 7C	Biomass, and Net Primary Productivity of a	ty, Arizona,
Water Resources of the Snake River	Tropical Grassland at Kurukshetra, India,	W75-10868 2G
Watershed, East-Central Minnesota,	W75-11006 2I	
W75-10946 7C	INDIAN LAKE (MASS)	Seasonal Variations in the Infiltration Rate of a
	Preliminary Investigations into Copper Cycling	Whitehouse Soil in Southern Arizona, W75-10873
Water Resources of the Lower Minnesota	in Indian Lake, Massachusetts: A Lake Treated	W75-10873 2G
River Watershed, South-Central Minnesota,	Annually with Copper Sulfate,	Induced Infiltration Supply System Among Big-
W75-10947 7C	W75-11039 5B	gest.
Water Resources of the Cannon River		W75-11010 5F
Watershed, Southeastern Minnesota,	INDIAN RESERVATIONS	
W75-10948 7C	Products from Jojoba: A Promising New Crop	INFILTRATION RATES
	for Arid Lands.	Seasonal Variations in the Infiltration Rate of a
Study of Criteria and Models Establishing Op-	W75-10890 3F	Whitehouse Soil in Southern Arizona,
timum Level of Hydrogeologic Information for	INDUCED INFILTRATION	W75-10873 2G
Groundwater Basin Management,	Seasonal Variations in the Infiltration Rate of a	INFORMATION EXCHANGE
W75-11042 2F	Whitehouse Soil in Southern Arizona,	The Awareness of the Relevant Water
Detection of Change in Sequences of	W75-10873 2G	Resources Literature by the Personnel of the
Hydrologic Data,		Wisconsin Department of Natural Resources,
W75-11302 7C	Induced Infiltration Supply System Among Big-	W75-10899 10C
	gest.	
HYDROLOGIC PROPERTIES	W75-11010 5F	Information as a Regulatory Tool in Water
The Nature and Components of the Hydrologi-	INDUSTRIAL PRODUCTION	Quality Control,
cal Cycle,	An Economic Analysis of the Pollution	W75-10903 5G
W75-10864 2A	Problems in the Colorado River Basin: The	THE ORDER OF THE O
HYDROLOGY	Upper Main Stem Sub-Basin,	INFORMATION RETRIEVAL
Review of Conference on Hydrology of Deep	W75-11247 5G	Development of a Bibliographic Information
Sedimentary Basins,		System for Water Yield Improvement Prac-
W75-10935 5B	INDUSTRIAL WASTES	tices, W75-11050 10B
	Wastewater Treatment Plant Odors: A Continu-	100
HYPOCHLORITE CELLS	ing Enigma,	INFORMATION TRANSFER
On-Site Hypochlorite Generation,	W75-10986 5D	The Awareness of the Relevant Water
W75-11109 5D	Process for Treating Industrial Wastes,	Resources Literature by the Personnel of the
ICE COVER	W75-11066 5D	Wisconsin Department of Natural Resources,
Thermal Response of Heated Streams, Solution		W75-10899 10C
by the Implicit Method,	Process for Treating Industrial Wastes,	
W75-10909 5B	W75-11067 5D	INJECTOR PUMP
	Economic Applysis of Effluent Guidelines For	Will Submersibles Make Jet Pumps Obsolete.
Г ВАНО	Economic Analysis of Effluent Guidelines. Fer- roalloys Industry.	W75-11263 8C
Available Water-Holding Capacities of Soils in	W75-11250 5G	INORGANIC COMPOUNDS
Southern Idaho,	117511250	Near-Bottom Chemistry in the Eastern Pacific
W75-11140 2G	Upgrading Meat Packing Facilities to Reduce	and North Atlantic Oceans,
ILLINOIS	Pollution. (Part 1). In-Process Modifications	W75-10923 2K
Illinois Landfill Law May Effect Nearby	and Pretreatment,	
States.	W75-11320 5D	Solute-Solute Interactions in Ultrafiltration
W75-11011 5B	Upgrading Meat Packing Facilities to Reduce	Treatment of Paper Mill Wastes,
Concentration and Genera of Algae in Selected	Pollution. (Part 2). Waste Treatment,	W75-11334 5D
Illinois Streams, 1971-1973,	W75-11321 5D	INPUT-OUTPUT ANALYSIS
W75-11165 5A		An Economic Analysis of the Pollution
11/3-11/05	Upgrading Meat Packing Facilities to Reduce	Problems in the Colorado River Basin: The
Seasonal Abundance and Diversity of Benthos	Pollution. (Part 3). Choosing the Optimum	Upper Main Stem Sub-Basin,
in a Southern Illinois, USA Swamp,	Financial Strategy,	W75-11247 5G
W75-11312 2H	W75-11322 5D	
IMPOUNDMENTS	Upgrading Metal-Finishing Facilities to Reduce	The Economic Impact of Pollution Abatement:
Aquatic Plant Control Using Herbicides in a	Pollution. (Part 1). In-Process Pollution Abate-	The Case of Water Pollution by Degradable Or-
Large Potable Water Supply,	ment,	ganic Matter,
W75-11201 5G	W75-11324 5D	W75-11254 5G
		INSECTICIDES
INCINERATION	Upgrading Poultry-Processing Facilities to	Standard Curves for Nuvacron, Malathion,
Possibilities of Reutilization of Kaolin from	Reduce Pollution. (Part 2). Pretreatment of Poultry-Processing Wastes,	Sevin, DDT, and Kelthane Tested Against the
Biological Waste Water Sludges	W75-11329 5D	Mosquito Culex Pipiens L. and the
(Moeglichkeiten der Wiederverwertung von Kaolin aus biologischen Abwasserchlaemmen),	30	Microcrustacean Daphnia Magna Straus,
W75-11349 5D	Evaluation of the Adsorptive Properties of Fly	W75-11082 5B
30	Ash with Reference to a Pulp and Paper Mill	
INDIA	Waste Effluent,	Absorption and Elimination of Photodieldrin by
Effect of Soil-Water Relations on the Root	W75-11335 5D	Daphnia and Goldfish,
Porosity, Transpiration and Ion Uptake in Rice,	Possibilities of Reutilization of Kaolin from	W75-11085 5B
W75-10916 3F	Biological Waste Water Sludges	The Effects of Experimental Blackfly (Diptera:
Improving Productivity in Low Rainfall Areas,	(Moeglichkeiten der Wiederverwertung von	Simuliidae) Larviciding with Abate, Dursban,
in India.	Kaolin aus biologischen Abwasserchlaemmen),	and Methoxychlor on Stream Invertebrates,
W75-11099 3F	W75-11349 5D	W75-11157 5C

C

A g al

٨ ji-A p-7C

2E nd in, 4A ea,

2F

JO.

JU

KA

KE CO FF VV VV KIP T in it is v

LACCOW

INSTITUTIONAL CONSTRAINTS

INSTITUTIONAL CONSTRAINTS	INVESTMENT	IRRIGATION PRACTICES
Legal and Institutional Problems in the	A Case Study of Some Economic Aspects of	Sprinkler Irrigation Practice, (La Pratique De
Management of Salinity,	the National Flood Insurance Program,	L'Irrigation Par Aspersion), W75-10875
W75-11047 5G	W75-10906 6F	W75-10875 3F
Institutional Arrangements for Reducing Con-	IRAN	IRRIGATION PROGRAMS
flict Over Water Quality in International	Shrub Transplanting for Watershed Manage-	Successful Irrigation: Preparation, Realization,
Rivers,	ment and Range Improvement in Iran,	Exploritation, (Savoir Irriguer: Preparation,
W75-11242 6E	W75-10870 4D	Realisation, Exploitation),
INSTITUTIONS	IRON	W75-10874 3F
Successful Irrigation: Preparation, Realization,	Studies on the Inorganic Components of	IRRIGATION WATER
Exploritation, (Savoir Irriguer: Preparation,	Marine Animals-III, on the Contents of Cadmi-	Phytophthora Species in Arizona: Its Occur-
Realisation, Exploitation),	um, Zinc, Copper, Lead and Iron in Muscle	rence in Recycled Irrigation water,
W75-10874 3F	and Viscera of Marine Animals Captured in the	W75-10883 5A
DICTION OF STREET	West Sea Area of Kyushu, (In Japanese),	Occurrence of 2, 4, 5-T and Picloram in Sur-
INSTRUMENTATION A Simple and Inexpensive Technique for	W75-11087 5C	face Runoff Water in the Blacklands of Texas,
Determining Colored Light Intensity Un-	IRON ALLOYS	W75-10895 5B
derwater,	Economic Analysis of Effluent Guidelines. Fer-	
W75-10919 7B	roalloys Industry.	ISOPODS
	W75-11250 5G	Factors Influencing Acute Toxicity Estimates of Hydrogen Sulfide to Freshwater Inver-
Note on the Measurement of the Response of		tebrates,
Oceanographic Temperature Sensors, W75-11146 7B	IRON REMOVAL	W75-11027 5C
W/3-11140	How Silica Affects Iron Removal from Groundwater,	
Investigation of the Operating Characteristics	W75-11016 5F	SOTOPE STUDIES Would Theory of Glaciation Supported by
of the Iowa Sediment Concentration Measuring		Weyl's Theory of Glaciation Supported by Isotopic Study of Norwegian Core K 11,
System,	IRRADIATION	W75-11153
W75-11163 2J	Aquatic Weed Field Test Program Using a CO2	
Apparatus for Concentration of Volatile Or-	Electric Discharge Convection Laser,	JAPAN
ganic Pollutants in Water,	W75-11208 5A	Some Observations on Behavior of the Treated
W75-11342 5A	CO2 Laser Effects on Water Hyacinth,	Sewage Disposed in the Sea, W75-11020 5B
PUTTER ATTE CONTROL METHODS	W75-11209 5G	W /3-11020 3B
INTEGRATED CONTROL METHODS Integrated Controls on Noxious Aquatic Plants,	TO THE LETTER LE	Cultivation of Netted Melon By Use of Trickle
W75-11204 5G	IRRIGATION Effects of Irrigation in Rain-Fed Fields on the	Irrigation in a Sand Field Plastic Greenhouse,
	Growth and Yield of Upland Rice Varieties, (In	(In Japanese), W75-11095 3F
INTER-BASIN TRANSFERS	Korean),	W75-11095 3F
Interbasin Water Transfers: A Case Study in	W75-10853 3F	Nozzle Hydraulics in the Trickle Irrigation
Mexico, W75-10879 4A	Consolidation and Bahabilitation of Consla in	SystemRelation Between Water Temperature
W/3-100/9	Consolidation and Rehabilitation of Canals in Poudre Valley,	and Nozzle Flow Rate (In Japanese),
INTERCEPTION	W75-11061 4A	W75-11096 3F
Approximate Annual Water Budgets of Two		Practical Application of Surface Fixed-System
Chained Pinyon-Juniper Sites,	Cultivation of Netted Melon By Use of Trickle	for Multi-Purpose Sprinkler Irrigation Uses, (In
W75-10896 4A	Irrigation in a Sand Field Plastic Greenhouse, (In Japanese),	Japanese),
INTERFERENCE EFFECTS	W75-11095 3F	W75-11097 3F
Deprivation Contribution and Interference Ef-		Studies on the Relationship Between Dry-
fects of Multiple Wells in a Common Aquifer,	Nozzle Hydraulics in the Trickle Irrigation	Matter Production and the Development of a
W75-11142 4B	SystemRelation Between Water Temperature and Nozzle Flow Rate (In Japanese),	Pine Forest on Coastal Sand Dunes (1), (In
INTERNATIONAL BOUND AND WATER	W75-11096 3F	Japanese),
COMM		W75-11098 4A
Institutional Arrangements for Reducing Con-	Practical Application of Surface Fixed-System	Uranium Mineralization by Ground Water in
flict Over Water Quality in International	for Multi-Purpose Sprinkler Irrigation Uses, (In Japanese),	Sedimentary Rocks, Japan.
Rivers, W75-11242 6E	W75-11097 3F	W75-11145 2F
0E	51	JAPAN (WEST SEA AREA-KYUSHU)
INTERNATIONAL JOINT COMMISSION	The Effect of Irrigation on the Yield and Quali-	Studies on the Inorganic Components of
Institutional Arrangements for Reducing Con-	ty of Maincrop Potatoes,	Marine Animals-III, on the Contents of Cadmi-
flict Over Water Quality in International	W75-11106 3F	um, Zinc, Copper, Lead and Iron in Muscle
Rivers, W75-11242 6E	IRRIGATION EFFECTS	and Viscera of Marine Animals Captured in the West Sea Area of Kyushu, (In Japanese),
W 13 11312	Cultivation of Netted Melon By Use of Trickle	W75-11087 5C
INVERTEBRATES	Irrigation in a Sand Field Plastic Greenhouse,	
Epifaunal Invertebrates as Indicators of Water	(In Japanese), W75-11095 3F	JEBEL MARRA AREA (SUDAN)
Quality in Southern Lake Pontchartain, W75-10852 5C	W.5-11055	Land and Water Resources Survey in the Jebel Marra Area, The Sudan.
30	IRRIGATION EFFICIENCY	W75-11139 4A
Species Diversity of Benthic Macroin-Ver-	Practical Application of Surface Fixed-System	
tebrates and Limnological Conditions in a 1st	for Multi-Purpose Sprinkler Irrigation Uses, (In	Condensation in Lete Industrial Physics and
Order Mountain Stream, W75-10918 2I	Japanese), W75-11097 3F	Condensation in Jets, Industrial Plumes and Cooling Tower Plumes,
10 10 10 10 10 10 10 10 10 10 10 10 10 1		W75-11166 2B
Factors Influencing Acute Toxicity Estimates	IRRIGATION PRACTICE	
of Hydrogen Sulfide to Freshwater Inver- tebrates.	Scheduling and Application Rates of Irrigation in a Humid Climate,	The Mechanics of Rock Failure Due to Water Jet Impingement,
W75-11027 5C	W75-11048 3F	W75-11272 8E

	· ·	
JOJOBA	LAKE CORPUS CHRISTI (TEX)	LAKE PAAJARVI (FINLAND)
Products from Jojoba: A Promising New Crop	Aquatic Plant Control on Lake Corpus Christi,	A General Description of the Oligotrophic Lake
for Arid Lands.	W75-11194 5G	Paajarvi, Southern Finland, and the Ecological
W75-10890 3F		Studies on It,
	LAKE ERIE	W75-11229 5C
JUNIPER TREES	Primary Production in Lakes Ontario and Erie:	
Effects of Pinyon-Juniper Removal on Natural	A Comparative Study,	LAKE PONTCHARTRAIN (LA)
Resource Products and Uses in Arizona,	W75-11217 5C	Epifaunal Invertebrates as Indicators of Water
W75-10886 3B		Quality in Southern Lake Pontchartain,
	Microbiological Examination of Offshore Lake	. W75-10852 5C
JUVENILE GROWTH STAGE	Erie Sediments,	
Effects of Some Components of Crude Oil on	W75-11218 5C	LAKE POWELL (ARIZ-UTAH)
Young Coho Salmon,	*	Man's Impact on a Newly Formed Reservoir,
W75-11088 5C	Seasonal Abundance of Crustacean Zooplank-	W75-11233 5C
	ton and Net Plankton Biomass of Lakes Huron,	
KANSAS	Erie, and Ontario.	LAKE REHABILITATION
Temperatures of Kansas Streams,	W75-11238 5C	Acid Strip Mine Lake Recovery,
W75-10933 2E	W/3-11230	W75-11224 5C
11/3/10/33	Preliminary Information on the Nature of Or-	
KAOLIN	ganic Matter in the Surface Sediments of Lakes	LAKE SEDIMENTS
Possibilities of Reutilization of Kaolin from	Huron, Erie, and Ontario,	Concurrent Nitrification-Denitrification at the
Biological Waste Water Sludges	W75-11240 2J	Sediment-Water Interface as a Mechanism for
(Moeglichkeiten der Wiederverwertung von	W 75-112-40 23	Nitrogen Losses from Lakes,
Kaolin aus biologischen Abwasserchlaemmen),	LAKE FISHERIES	W75-10902 5C
W75-11349 5D	Some Limnological Characteristics of Arivaca	
W/3-11349		The Geochemical Cycle of Arsenic in Lake
KENTUCKY	Lake in Southern Arizona,	Washington and its Relation to Other Elements,
Covariance Analysis of Reservoir Development	W75-10891 2H	W75-10922 5B
	LAVE HEENED (OV)	
Effects on Property Tax Base,	LAKE HEFNER (OK)	Microbiological Examination of Offshore Lake
W75-10851 6B	Wind Effects on Chemical Films for Evapora-	Erie Sediments,
The Law of Water Allocation in Kentucky,	tion Suppression at Lake Hefner,	W75-11218 5C
	W75-10920 3B	
W75-10898 6E		Application of the Manometric Technique in
KINEMATIC WAVE THEORY	LAKE HURON	the Study of Sediment Oxygen Depletion,
Derivation of Surface Water Lag Time for Con-	Seasonal Abundance of Crustacean Zooplank-	W75-11222 5C
	ton and Net Plankton Biomass of Lakes Huron,	
verging Overland Flow,	Erie, and Ontario,	Preliminary Information on the Nature of Or-
W75-11156 2E	W75-11238 5C	ganic Matter in the Surface Sediments of Lakes
KINETICS		Huron, Erie, and Ontario,
	Preliminary Information on the Nature of Or-	W75-11240 2J
The Kinetics of Crystallization of Scale-Form-	ganic Matter in the Surface Sediments of Lakes	
ing Minerals,	Huron, Erie, and Ontario,	LAKE WABAMUN (ALBERTA)
W75-11273 8G	W75-11240 2J	The Growth of Some Epiphytic Algae in a Lake
KIRKLAND CREEK (ARIZ)		Receiving Thermal Effluent,
	LAKE KAINJI (NIGERIA)	W75-11225 5C
Hydrogeology and Water Resources of Middle	The Effects of the Formation of Lake Kainji	
Kirkland Creek Basin, Yavapai County,	(Nigeria) Upon the Indigenous Fish Population,	LAKE WARNIAK (POLAND)
Arizona,	W75-11223 5C	Experimentally Increased Fish Stock in the
W75-10872 4B		Pond Type Lake Warniak. IV. Feeding of In-
LABORATORY TESTS	LAKE MCMILLAN (N MEX)	troduced and Autochthonous Non-Predatory
LABORATORY TESTS	An Appraisal of Potential Water Salvage in the	Fish,
Continuous Automatic Monitoring of Surface	Lake McMillen Delta Area, Eddy County, New	W75-11234 5C
Water with Fish,	Mexico,	
W75-11079 5A	W75-10941 3B	LAKE WASHINGTON (WASH)
Effects of Estrono I Harbon Co. 'II	32	The Geochemical Cycle of Arsenic in Lake
Effects of Entrance Loss on Harbor Oscilla-	LAKE MICHIGAN	Washington and its Relation to Other Elements,
tions,	Investigation of the Influence of Thermal	W75-10922 5B
W75-11147 8B	Discharge from a Large Electric Power Station	
Charged Droplet Collision Efficiency Measure-	on the Temperature and Near-Shore Circula-	LAKES
	tion of Lake Michigan,	Two-Dimensional, Hydrostatic Simulation of
ments,	W75-11190 5C	Thermally-Influenced Hydrodynamic Flows,
W75-11168 2B	30	W75-10901 2H
Field Testing of Aquatic Herbicides for Control	LAKE ONTARIO	
	Primary Production in Lakes Ontario and Erie:	Wind Effects on Chemical Films for Evapora-
of Egeria Densa,	A Comparative Study,	tion Suppression at Lake Hefner,
W75-11200 5G	W75-11217 5C	W75-10920 3B
LAGOMORPHS	W/3-1121/	
The Influence of Rainfall on the Reproduction	In Situ Measurement of the Settling Velocity	Stability of Nitrosamines in Samples of Lake
	Profile of Particulate Organic Carbon in Lake	Water, Soil, and Sewage,
of Sonoran Desert Lagomorphs,	Ontario.	W75-11019 5B
W75-10871 4A	W75-11227 5C	Hallington of Canan Days Dt
LAGOONS	W 13*11221 3C	Utilization of Stream-Borne Phosphorus by
The Water Quality and Bottom Sediment	Seasonal Abundance of Crustacean Zooplank-	Cayuga Lake Phytoplankton,
	ton and Net Plankton Biomass of Lakes Huron,	W75-11036 SC
	Erie, and Ontario,	Hudenulic Modeling of Mining Dhongman i-
Developments,		Hydraulic Modeling of Mixing Phenomena in
W75-11104 5B	W75-11238 5C	Stratified Lakes,
TAVE CHUB (FIGU)	Preliminary Information on the Nature of Or-	W75-11043 2H
LAKE CHUB (FISH)	ganic Matter in the Surface Sediments of Lakes	Dissolved Organic Matter and Lake Metabol-
Acute Toxicity of Petrochemical Drilling Fluids	Huron, Erie, and Ontario,	ism,
Components and Wastes to Fish,		W75-11188 5C
W75-11265 5C	W75-11240 2J	11 13-11100

in F

of nile he

C

nd 2B ter

LE

LIN

MA R N N

The Growth of Some Epiphytic Algae in a Lake	LANDFILLS	LEAVES
Receiving Thermal Effluent,	Illinois Landfill Law May Effect Nearby	Root:Shoot and Leaf Area Relationships of
W75-11225 5C	States.	Macrophyte Communities in Chautauqua Lake,
A General Description of the Oligotrophic Lake	W75-11011 5B	New York,
Paajarvi, Southern Finland, and the Ecological	Libraciania	W75-11009 5C
Studies on It.	LANDSCAPING	The Role of Endogenous Abscisic Acid in the
W75-11229 5C	Water Application Practices and Landscape At-	Response of Plants to Stress,
	tributes Associated with Residential Water	W75-11319 3F
Sediment Processes in Great Lakes,	Consumption,	
W75-11237 2J	W75-11059 3D	LEGAL ASPECTS
	LARVAE	Facing the Real Cost of Clean Water,
The Utilization of Sun-Glint in a Study of Lake		W75-10857 5G
Dynamics,	A Reevaluation of the Combined Effects of	I EGIST ATTON
W75-11239 5A	Temperature and Salinity on Survival and	LEGISLATION
The Measurement and Estimation of Lake	Growth of Bivalve Larvae Using Response	Facing the Real Cost of Clean Water,
Evaporation from Four Australian Water	Surface Techniques,	W75-10857 5G
Storages,	W75-11081 5C	Human Obstacles to the Control of the
W75-11300 2D	LARVICIDES	Hydrological Cycle for the Benefit of Man,
113 11300	The Effects of Experimental Blackfly (Diptera:	W75-10866 2A
LAMELLA SEDIMENTATION		
Lamella Sedimentation: A Compact Separation	Simuliidae) Larviciding with Abate, Dursban, and Methoxychlor on Stream Invertebrates,	Information as a Regulatory Tool in Water
Technique,		Quality Control,
W75-10989 5D	W75-11157 5C	W75-10903 5G
Management of the Colonial Colonia Colonial Colonial Colo	LASER	P. L. I. D. S. State Call. P. C.
LAMELLA SEPARATORS	Aquatic Weed Field Test Program Using a CO2	Role and Responsibilities of the Environmental
Lamella Sedimentation: A Compact Separation	Electric Discharge Convection Laser,	Protection Service (Canada),
Technique,	W75-11208 5A	W75-11000 6G
W75-10989 5D	W/3-11200	Milestone Water Legislation Accompanied by
LAMINAR FLOW	CO2 Laser Effects on Water Hyacinth,	Millstone of Bureaucratic Red Tape,
	W75-11209 5G	W75-11007 5G
Transition in Oscillatory Flow Over Rippled Beds,	W/3-11209	
W75-11149 8B	LAWRENCE LAKE (MICH)	Illinois Landfill Law May Effect Nearby
W 75-11149 6B	Dissolved Organic Matter and Lake Metabol-	States.
LAND DISPOSAL	ism.	W75-11011 5B
Limitations of Using a Simulation Model of the	W75-11188 5C	
Soil Under Irrigated Cultivation to Simulate the	11/3-11/00	Criteria for Herbicide Evaluation,
Functioning of the Soil as a Purifying System	LEACHATE	W75-11196 5G
(Limites D'Utilisation D'Un Modele de Com-	Solid Wastes, Animal Refuse, and Organic	LETHAL LIMIT
portement du sol sous Culture Irriguee Pour	Residues Disposal, and the Quality of Ground	Some Effects of Copper on the Polychaete
Simuler le Fonctionnment du sol Comme	Water,	Phyllodoce Maculata,
Systeme Epurateur),	W75-11244 5B	W75-11136 SC
W75-11125 5B		1175-11150
	LEACHING	LIGH INTENSITY
LAND MANAGEMENT	Uranium Mineralization by Ground Water in	A Simple and Inexpensive Technique for
Improving Productivity in Low Rainfall Areas,	Sedimentary Rocks, Japan.	Determining Colored Light Intensity Un-
in India.	W75-11145 2F	derwater,
W75-11099 3F		W75-10919 7B
LAND RECLAMATION	LEAD	LIGHT BENETE ATTOM
Guidelines for Revegetation and Stabilization	Geochemical Reconaissance of Surficial	LIGHT PENETRATION
of Surface Mined Areas in the Western States,	Materials in the Vicinity of Shawangunk Moun-	A Simple and Inexpensive Technique for Determining Colored Light Intensity Un-
W75-11100 4D	tain, New York,	derwater,
40	W75-10928 5A	W75-10919 7B
LAND RESOURCES		W 15-10313
Land and Water Resources Survey in the Jebel	Uptake of Cadmium, Zinc, Copper, Lead and	LIGNINS
Marra Area, The Sudan.	Chromium in the Pacific Oyster, Crassostrea	Biodegradation of Components of Pulp Waste
W75-11139 4A	Gigas, Grown in the Tamar River, Tasmania,	Effluents by Bacteria. (1). Degradation of Kraft
AND CURCINENCE	W75-11086 5B	Lignin (In Japanese),
LAND SUBSIDENCE	Studies on the Increase Company	W75-11346 5B
Ground Water Depletion and Subsidence	Studies on the Inorganic Components of	LICHOSHI FATE
Problems in Taipei Basin,	Marine Animals-III, on the Contents of Cadmi-	LIGNOSULFATE
W75-11262 4B	um, Zinc, Copper, Lead and Iron in Muscle	Acute Toxicity of Petrochemical Drilling Fluids
LAND USE	and Viscera of Marine Animals Captured in the	Components and Wastes to Fish, W75-11265 5C
Balancing the Effects of Man's Actions on the	West Sea Area of Kyushu, (In Japanese),	W75-11265 5C
Hydrological Cycle,	W75-11087 5C	LIME
W75-10865 2A	The Use of Snakes as a Pollution Indicator	Chemical-Biological Treatment With Biological
871		Filters,
Floodplain Land-Use Management: An Appli-	Species, W75-11089 5B	W75-11123 5D
cation of Operations Research Methodology,	W75-11089 5B	
W75-11037 6F	Mutagens and Potential Mutagens in the Bio-	Effect of Lime Treatment on Molecular Weight
Description Promote Management	sphere: II. MetalsMercury. Lead. Cadmium	Distribution of Color Bodies from Kraft Liner-
Prescriptive Economic Models for Nonstruc-	and Tin.	board Decker Effluents,
tural Flood Control,	W75-11171 5B	W75-11345 5D
W75-11060 6F	ЭВ	LIMITING FACTORS
Improving Productivity in Low Rainfall Areas,	LEAKAGE	Guidelines for Revegetation and Stabilization
in India.	How to Seal Tubing Collar Leaks.	of Surface Mined Areas in the Western States,
W75-11099 3F	W75-11287 8C	W75-11100 4D

LIMNOLOGY	MANAGEMENT	Abundance, and Cell Size Distribution of Tin-
Limnology of Desert Ponds,	Successful Irrigation: Preparation, Realization,	tinnida,
W75-10880 2F	The state of the s	W75-11191 5C
Some Limnological Characteristics of Arivaca	Realisation, Exploitation),	MARINE PLANTS
Lake in Southern Arizona,	W75-10874 3F	Transplanting Sea Grass in Mississippi Sound,
W75-10891 2F	Deprivation Contribution and Interference Effects of Multiple Wells in a Common Aquifer,	W75-11207 4A
LINEAR PROGRAMMING	W75-11142 4B	MARKOV PROCESSES
Prescriptive Economic Models for Nonstruc		Multilag Markov Models for Eastern Australian
tural Flood Control,	Strategic Approach to Estuarine Environmental	Streams,
W75-11060 61		W75-11301 2E
LININGS	W75-11179 2L	MARMOT CREEK (ALBERTA)
Techniques for Linear Tie-Back Cementing,	Distribution-System Operation Analysis Model,	Wind-Snow Relations at Marmot Creek, Al-
W75-11277 81		berta.
		W75-11226 2C
How to Seal Tubing Collar Leaks.	Simulation of Water Quality Management Poli-	
W75-11287		MARSHES
LIQUID WASTES	W75-11181 5G	Impact of Thermal Effluent from Steam-Elec-
Problems of Liquid Waste Disposal,	MANGANESE	tric Station on a Marshland Nursery Area dur- ing the Hot Season,
W75-11112 50	The Accumulation of Cadmium, Copper, Man-	W75-11032 5C
LOCGING (BECORDING)	ganese and Zinc by Fucus Vesiculosus in the	W/3-11032
LOGGING (RECORDING) Making Log Analysts of Geologists.	Bristol Channel,	MARYLAND
W75-11288	W75-11083 5B	Behavior of Mn, Fe, Cu, Zn, Cd and Pb
113-11200	MANOMETERS	Discharged from a Wastewater Treatment Plant
LOUISIANA	Application of the Manometric Technique in	into an Estuarine Environment,
Epifaunal Invertebrates as Indicators of Water	the Study of Sediment Oxygen Depletion,	W75-11160 5B
Quality in Southern Lake Pontchartain,	W75-11222 5C	Algae in Baltimore's Reservoirs,
W75-10852		W75-11221 5C
The Louisiana Environmental Managemen	MAPLE	
System and Its Utility in Water Resource	vegetation, Soil, and Climate on the Green	MASS TRANSFER
Planning,	Mountains of Vermont, W75-11021 21	Some Results on Mass Transfer Processes in a Density-Stratified Flow.
W75-11177 50) W/3-11021	W75-11057 8B
Field Tests of Slow-Release Herbicides.	MAPPING	11.5-11057
W75-11193 50	Making Log Analysts of Geologists.	MASSACHUSETTS
W/3-11123	W75-11288 7C	Environmental Impact Evaluation in Fresh-
CO2 Laser Effects on Water Hyacinth,	MAPS	water Impoundments by Vegetation Analysis of
W75-11209 50	The Hydrologic CycleAs Applicable to the	the Terrestrial Ecosystem,
Water Level Manipulation: A Tool for Aquati		W75-10905 21
Weed Control,	W75-10949 7C	Map Showing Depth to Bedrock, Worthington
W75-11216 4		Quadrangle, Massachusetts,
	Soil Map of the World, 1:5,000,000, Volume	W75-10951 7C
LOW FLOW	IV, South America. s W75-11138 7C	Map Showing Depth to Bedrock, Greenfield
Low-Flow Characteristics of Selected Stream in Northeastern Washington,	s w/3-11136	Quadrangle, Massachusetts,
W75-10939 2	Land and Water Resources Survey in the Jebel	W75-10952 7C
	Marra Area, The Sudan.	
LOW FLOW FREQUENCY	W75-11139 4A	Map Showing Depth to Bedrock, Chester
Droughts, Distributions and Dependence: A		Quadrangle, Massachusetts, W75-10953 7C
Analysis of Some Synthetic Data Generation Methods.	Influence of Oil on Nucleic Acids of Algae,	W /3-10933
	E W75-11232 5C	Preliminary Investigations into Copper Cycling
		in Indian Lake, Massachusetts: A Lake Treated
LOWER MINNESOTA RIVER (MINN)	MARINE ANIMALS	Annually with Copper Sulfate,
Water Resources of the Lower Minneso		W75-11039 5B
River Watershed, South-Central Minnesota,	Fertilization and Development, C W75-11091 5C	MATAGORDA ISLAND (TEX)
W75-10947	50	Matagorda Island, Texas: The Evolution of a
LOWER ST. CROIX RIVER (MINN)	MARINE FISH	Gulf Coast Barrier Complex,
Water Resources of the Lower St. Croix Rive		W75-11144 21.
Watershed, East-Central Minnesota,	Fertilization and Development,	MATHEMATICAL ANALYSIS
W75-10945	C W75-11091 5C	Theory of Plasticity of Porous Media with
LUBRICANTS	A Survey of Fishes and Commercial Inver-	Fluid Flow.
Special Annulus Fluid Eases Casing Recovery		W75-11276 8E
	G Between Cape Romano and Cape Sable,	
LYSIMETERS	Florida,	MATHEMATICAL MODELS
Differential Release of Water from Arizon	W75-11189 2I	A Three-Dimensional Model for Estuaries and Coastal Seas: Vol. II, Aspects of Computation,
Snowpacks,	MARINE MICROORGANISMS	W75-10900 21
	C Ammonia Excretion by Zooplankton and its	
	Significance to Primary Productivity During	Thermal Response of Heated Streams, Solution
MACROPHYTES Boot-Shoot and Loof Area Balationships	Summer,	by the Implicit Method,
Root:Shoot and Leaf Area Relationships Macrophyte Communities in Chautauqua Lak		W75-10909 SI
New York.	The Role of Planktonic Protozoa in the Marine	Wave Motion in Rockfill,
W75-11009	C Food Chain. Seasonal Changes, Relative	W75-10924 81

B

te ft В

SC

SD ght er-5D

ion s,

8D

M

M

MIT H

MATHEMATICAL MODELS

Floodplain Land-Use Management: An Appli-	MELT WATER	Some Effects of Copper on the Polychaete
cation of Operations Research Methodology,	Differential Release of Water from Arizona	Phyllodoce Maculata,
W75-11037 6F	Snowpacks,	W75-11136 SC
A MALES A MALLE OF A MALE	W75-10860 2C	D
A Mathematical Model for Optimal Waste	Subsurface Flow from Snowmelt Traced by	Behavior of Mn, Fe, Cu, Zn, Cd and Pb
Load Allocations,	Tritium,	Discharged from a Wastewater Treatment Plant
W75-11102 5G	W75-10921 2F	into an Estuarine Environment, W75-11160 5B
Optimum Values for Operational Variables in	11/2-10/21	W75-11160 5B
Turbidity Removal.	MEMBRANE PROCESSES	Upgrading Metal-Finishing Facilities to Reduce
W75-11110 5D	Membrane Desalting Gets Big Push,	Pollution. (Part 1). In-Process Pollution Abate-
35	W75-10982 3A	ment.
Hydrologic Investigation and Design of Urban	MEMBER	W75-11324 SD
Stormwater Drainage Systems,	MENUKE Mercury Contents in Biologically Preserved	
W75-11141 4A	Mercury Contents in Biologically Preserved Specimens of Menuke (Sebastes Baramenuke	Upgrading Metal-Finishing Facilities to Reduce
	and S. Flammeus),	Pollution. (Part 2). Waste Treatment,
The Design of Storm Water Drainage Channels	W75-11078 5A	W75-11325 5D
Using Mathematical Model Techniques,	W 13-110/6	
W75-11150 8B	MERCURY	METHANE
Approximation for Standy Interface Beneath a	Mercury Content of Whales, (In Japanese),	Anaerobic Acidogenesis of Wastewater Sludge,
Approximation for Steady Interface Beneath a	W75-11029 5B	W75-10976 5D
Well Pumping Fresh Water Overlying Salt Water,	M	METHODOLOGY
W75-11255 4B	Mercury Contents in Biologically Preserved	Predicting Recessions Through Convolution,
W/3-11233	Specimens of Menuke (Sebastes Baramenuke	W75-10917 2E
MATHEMATICAL STUDIES	and S. Flammeus), W75-11078 5A	W 75-10917
Effects of Entrance Loss on Harbor Oscilla-	W/3-110/6	Registration of Aquatic Herbicides,
tions,	Mutagens and Potential Mutagens in the Bio-	W75-11212 4A
W75-11147 8B	sphere: II. MetalsMercury, Lead, Cadmium	
	and Tin,	How to Make Squeeze Cementing Successful,
Derivation of Surface Water Lag Time for Con-	W75-11171 5B	W75-11286 8F
verging Overland Flow,		
W75-11156 2E	Interference of Mercury(II) in the Colorimetric	Casing-Seat Testing - Why and How,
	Determination of Inorganic Phosphate in	W75-11291 8F
MEASUREMENT	Water, W75-11340 5A	Warner Garage Committee Trans
Measures of Biodegradability and Refractory	W75-11340 5A	How to Conduct Corrosion Tests,
Organics in Wastewaters: (Analysis, Interpreta-	METABOLISM	W75-11292 8G
tion, and Application of Measurement	Toxaphene Effects on Growth and Bone Com-	METHOXYCHLOR
Techniques),	position of Fathead Minnows, Pimephales	The Effects of Experimental Blackfly (Diptera:
W75-11103 5D	Promelas,	Simuliidae) Larviciding with Abate, Dursban,
Simple Field Checks Will Provide Accurate	W75-11026 5C	and Methoxychlor on Stream Invertebrates,
DST Data,		W75-11157 5C
W75-11281 8G	Dissolved Organic Matter and Lake Metabol-	
117211201	ism,	METHYL MERCURY
How to Find Transition Zones in Soft Forma-	W75-11188 5C	Mercury Content of Whales, (In Japanese),
tions,	METAL FINISHING WASTES	W75-11029 5B
W75-11285 8G	Upgrading Metal-Finishing Facilities to Reduce	
	Pollution. (Part 1). In-Process Pollution Abate-	MEXICO
MEAT PACKING INDUSTRY	ment,	Phenology of Selected Sonoran Desert Plants at
Economic Analysis of Effluent Guidelines:	W75-11324 5D	Punta Cirio, Sonora, Mexico.
Meat Packing Industry,	Harmatian Matal Pinishian Facilities to Badana	W75-10862 2I
W75-11249 5G	Upgrading Metal-Finishing Facilities to Reduce	Interbasin Water Transfers: A Case Study in
Upgrading Meat Packing Facilities to Reduce	Pollution. (Part 2). Waste Treatment, W75-11325 5D	Mexico,
Pollution. (Part 1). In-Process Modifications	W 73-11323	W75-10879 4A
and Pretreatment,	METALS	
W75-11320 5D	Copper Toxicity in Busycon Canaliculatum L.,	MICHIGAN
	W75-11031 5C	City/Township Joint Venture A New Water
Upgrading Meat Packing Facilities to Reduce	Manusay Contents is Distribute D.	Plant,
Pollution. (Part 2). Waste Treatment,	Mercury Contents in Biologically Preserved	W75-11015 5F
W75-11321 5D	Specimens of Menuke (Sebastes Baramenuke and S. Flammeus).	THE PARTY OF THE P
	W75-11078 5A	Dissolved Organic Matter and Lake Metabol-
Upgrading Meat Packing Facilities to Reduce	W/3-110/6	ism,
Pollution. (Part 3). Choosing the Optimum	The Accumulation of Cadmium, Copper, Man-	W75-11188 5C
Financial Strategy,	ganese and Zinc by Fucus Vesiculosus in the	Changes in Vegetation and Surface Soil Proper-
W75-11322 5D	Bristol Channel,	ties Following Irrigation of Woodlands with
MECHANICAL AERATORS	W75-11083 5B	Municipal Wastewater,
Aeration Devices: Basic Theory,	Hateka of Codming Time Conner London	W75-11243 5B
W75-10971 5D	Uptake of Cadmium, Zinc, Copper, Lead and	36
30	Chromium in the Pacific Oyster, Crassostrea Gigas, Grown in the Tamar River, Tasmania.	MICROBIAL DEGRADATION
MECHANICAL PULPING	W75-11086 5B	Temperature Effects on Microbial Growth in
Effluent Characteristics and Treatment of	11.3-11000 JB	CSTR's,
Mechanical Pulping Effluents,	Studies on the Inorganic Components of	W75-10968 5D
W75-11331 5D	Marine Animals-III, on the Contents of Cadmi-	An an area of the same of the
	um, Zinc, Copper, Lead and Iron in Muscle	MICROORGANISMS
Mill Experience in the Treatment of Mechani-	and Viscera of Marine Animals Captured in the	Microbiological Examination of Offshore Lake
cal Pulping Effluent,	West Sea Area of Kyushu, (In Japanese),	Eric Sediments,
W75-11332 5D	W75-11087 5C	W75-11218 5C

Control of the second		
MINERALOGY	Implicit Numerical Modeling of Unsteady	MONTE CARLO METHOD
Uranium Mineralization by Ground Water in	Flows,	Relative Importance of Decision Variables in
Sedimentary Rocks, Japan.	W75-10925 8B	Flood Frequency Analysis,
W75-11145 2F		W75-10929 4A
W/3-11143	Stochastic Analysis of Particle Movement Over	W 75-10929 4A
MINERALS	a Dune Bed.	Monocco
		MOROCCO
Non-Renewable, Non-Energy Resources,	W75-10942 2J	A Note on Salinity and Temperature in Some
W75-11253 6B		Moroccan Brackish Waters,
	Hierarchial Model for Water-Supply-System	W75-10997 2L
MINIMUM-ROUTE METHOD	Control,	
Improved Design of Distribution Networks by	W75-10996 4A	MORTALITY
Minimum Route,		Effect of DDT and M.S. 222 on Learning a
W75-11175 4A	Study of Criteria and Models Establishing Op-	
W/3-111/3	timum Level of Hydrogeologic Information for	Simple Conditioned Response in Rainbow
MINING	Groundwater Basin Management,	Trout (Salmo gairdneri),
		W75-11025 SC
Guidelines for Revegetation and Stabilization	W75-11042 2F	
of Surface Mined Areas in the Western States,		Factors Influencing Acute Toxicity Estimates
W75-11100 4D	Limitations of Using a Simulation Model of the	of Hydrogen Sulfide to Freshwater Inver-
	Soil Under Irrigated Cultivation to Simulate the	tebrates.
Non-Renewable, Non-Energy Resources,	Functioning of the Soil as a Purifying System	W75-11027 5C
W75-11253 6B	(Limites D'Utilisation D'Un Modele de Com-	
	portement du sol sous Culture Irriguee Pour	Survival and Growth Rate of Channel Catfish
Subsurface Water Tool for Petroleum Ex-		
ploration,	Simuler le Fonctionnment du sol Comme	as a Function of Dissolved-Oxygen Concentra-
	Systeme Epurateur),	tion,
W75-11289 4B	W75-11125 5B	W75-11051 5C
A APPLICATION A		
MINNESOTA	Water Quality Control in Sewage Water Treat-	Standard Curves for Nuvacron, Malathion
Water Resources of the Lower St. Croix River	ment, (In Japanese),	Sevin, DDT, and Kelthane Tested Against the
Watershed, East-Central Minnesota,	W75-11133 5D	Mosquito Culex Pipiens L. and the
W75-10945 7C	11 (3-11133 3D	Microcrustacean Daphnia Magna Straus,
	Washahan on Commuter Aided Design and	
Water Resources of the Snake River	Workshop on Computer-Aided Design and	W75-11082 5E
Watershed, East-Central Minnesota,	Simulation of Waste Treatment Systems.	
	W75-11338 5D	MOSQUITOS
W75-10946 7C		Standard Curves for Nuvacron, Malathion
	MOISTURE CONTENT	Sevin, DDT, and Kelthane Tested Against the
Water Resources of the Lower Minnesota	Soil Morphology and Soil Physical Properties:	Mosquito Culex Pipiens L. and the
River Watershed, South-Central Minnesota,	II. Mechanical Impedance and Moisture Reten-	Microcrustacean Daphnia Magna Straus,
W75-10947 7C	tion and Movement.	
	The state of the s	W75-11082 5E
Water Resources of the Cannon River	W75-10885 2G	
Watershed, Southeastern Minnesota,		MOUNT CARMEL (CONN)
W75-10948 7C	MOLECULAR WEIGHT	Map Showing Depth to Bedrock, Mount Car
W 13-10246	Effect of Lime Treatment on Molecular Weight	mel Quandrangle, Connecticut,
MINNOWS	Distribution of Color Bodies from Kraft Liner-	W75-10954 70
	board Decker Effluents,	
Toxaphene Effects on Growth and Bone Com-	W75-11345 · 5D	MOUNTAIN STREAMS
position of Fathead Minnows, Pimephales	W15-11545	Species Diversity of Benthic Macroin-Ver
Promelas,	MOLLUSKS	
W75-11026 5C		tebrates and Limnological Conditions in a 1s
	Use of Steelon-Net Veils for Protection of the	Order Mountain Stream,
MISSISSIPPI	Hydro-Engineering Works Against Dreissena	W75-10918 2
A Case Study of Some Economic Aspects of	Polymorphia Pall,	
the National Flood Insurance Program,	W75-11033 5G	MOUNTAINS
		An Elevational Control of Peak Snowpack
W75-10906 6F	A Reevaluation of the Combined Effects of	Variability,
0-1-0-1-0-1-1-1-1-1	Temperature and Salinity on Survival and	W75-11155 20
Organic Color in Groundwater of Mississippi,	Growth of Bivalve Larvae Using Response	11.5-11.55
W75-10907 5F		MUD
	Surface Techniques,	MUD
MISSISSIPPI RIVER	W75-11081 5C	Uptake of Cadmium, Zinc, Copper, Lead and
Thermal Response of Heated Streams, Solution		Chromium in the Pacific Oyster, Crassostre
by the Implicit Method,	Biomagnification of Dieldrin Residues by Food	Gigas, Grown in the Tamar River, Tasmania,
W75-10909 5B	Chain Transfer from Clams to Blue Crabs	W75-11086 5F
36	Under Controllled Conditions,	
MIXED INTEGER PROGRAMMING	W75-11135 5C	Tests Show Potassium Mud Versatility,
Distribution-System Operation Analysis Model,		W75-11284 80
	MONITORING	
W75-11180 5D	Continuous Automatic Monitoring of Surface	MULTIPLE-PURPOSE PROJECTS
MINING		The Louisiana Environmental Managemen
MIXING	Water with Fish,	
Hydraulic Modeling of Mixing Phenomena in	W75-11079 5A	System and Its Utility in Water Resource
Stratified Lakes,		Planning,
W75-11043 2H	Treatment Plant Monitoring Programs: A	W75-11177 50
	Preliminary Analysis,	
Some Results on Mass Transfer Processes in a	W75-11176 5D	MUNICIPAL WASTES
Density-Stratified Flow,		Wastewater Treatment Plant Odors: A Continu
W75-11057 8B	Dissipation of Residues of Phenoxy Herbicides	ing Enigma.
113-11037 8B	Applied for Water Milfoil Control in Large	W75-10986 5I
How DD Alaska Committee to Day 1	Reservoirs.	11.5-10900 31
How BP Alaska Cements Through Permafrost.		On Site Hypochlorite Constation
W75-11278 8F	W75-11198 5B	On-Site Hypochlorite Generation,
Manual Committee of the	A CONTRACTOR DOLLAR BOTTON	W75-11109 51
MODEL STUDIES	MONOMOLECULAR FILMS	
A Three-Dimensional Model for Estuaries and	Surface Tension Reductions and Urban Wastes	MUNICIPAL WATER
Coastal Seas: Vol. II, Aspects of Computation,	in The New York Bight,	Membrane Desalting Gets Big Push,
W75-10900 2L	W75-10927 5B	W75-10982 3/

C

B at 21 in

ter 5F ol-5C erith

in 5D

ake

5C

MUSKAT FLOW THROUGH POROUS MEDIA

MUSKAT FLOW THROUGH POROUS MEDIA	Finite-Element Method for Water-Distribution	The Role of Planktonic Protozoa in the Marine
Approximation for Steady Interface Beneath a	Networks,	Food Chain. Seasonal Changes, Relative
Well Pumping Fresh Water Overlying Salt	W75-11186 4A	Abundance, and Cell Size Distribution of Tin-
Water,	NUMBER AT THE APPROXY	tinnida,
W75-11255 4B	NEUTRALIZATION	W75-11191 50
MUSSELS	Acid Strip Mine Lake Recovery, W75-11224 5C	NEW YORK BIGHT
Use of Steelon-Net Veils for Protection of the	W13-11224	Surface Tension Reductions and Urban Wastes
Hydro-Engineering Works Against Dreissena	NEVADA	in The New York Bight,
Polymorphia Pall,	Quality of Water in Aquifers of the Amargosa	W75-10927 5B
W75-11033 5G	Desert and Vicinity, Nevada,	NOW YORK HARRON
* 1	W75-10932 5B	NEW YORK HARBOR Surface Tension Reductions and Urban Wastes
MUTAGENS Mutagens and Potential Mutagens in the Bio-	The Miner and Trees Flaments Con and	in The New York Bight,
sphere: I. DDT and Its Metabolites,	The Minor and Trace Elements, Gas, and Isotope Compositions of the Principal Hot	W75-10927 5B
Polychlorinated Biphenyls, Chlorodioxins,	Springs of Nevada and Oregon,	
Polycyclic Aromatic Hydrocarbons,	W75-10937 2K	NEW ZEALAND
Haloethers,	*	Mass-Emplaced Sand-Fingers at Mararoa Con- struction Site, Southern New Zealand,
W75-11170 5B	NEVADA ATOMIC TEST SITE	W75-11161 21
M	Quality of Water in Aquifers of the Amargosa	1175-11101
Mutagens and Potential Mutagens in the Bio-	Desert and Vicinity, Nevada,	The Aquatic Weed Problem. 1. Identification,
sphere: II. MetalsMercury, Lead, Cadmium and Tin,	W75-10932 5B	W75-11220 21
W75-11171 5B	NEW JERSEY	NIGERIA
W15-1111	The Water Quality and Bottom Sediment	The Effects of the Formation of Lake Kainji
NATIONAL FLOOD INSURANCE PROGRAM	Characteristics of New Jersey Lagoon	(Nigeria) Upon the Indigenous Fish Population,
The Economics of Flood Insurance: An Analy-	Developments,	W75-11223 50
sis of the National Flood Insurance Program,	W75-11104 5B	
W75-11038 6F	Dissipation of Phenoxy Herbicides Applied to	NITELLA HOOKERI
NATURAL FLOW	Riparian Vegetation,	A Contribution to the Biology of Nitella
Estimated Mean-Monthly and Annual Runoff	W75-11214 5B	Hookeri A. BR. in the Rotorua Lakes, New Zealand. II. Organic Nutrients and Physical
at Selected Sites in the Pojoaque River	W 13-11214 3B	Factors,
Drainage Basin, Santa Fe County, New Mex-	NEW MEXICO	W75-11235 50
ico,	Establishing Alkali Sacaton on Harsh Sites in	
W75-10943 2E	the Southwest,	NITRATES
NATURAL RESOURCES	W75-10882 4A	Pilot-Plant Study of Denitrification Using a Submerged Sand Filter at Rye Meads Sewage
Non-Renewable, Non-Energy Resources,	Estimated Availability of Surface and Ground	Works,
W75-11253 6B	Water in the Pojoaque River Drainage Basin,	W75-10955 5E
W. P. A. L. P.	Santa Fe County, New Mexico,	
NEAR-BOTTOM CHEMISTRY	W75-10938 4A	NITRIFICATION
Near-Bottom Chemistry in the Eastern Pacific	A. A	Concurrent Nitrification-Denitrification at the
and North Atlantic Oceans,	An Appraisal of Potential Water Salvage in the Lake McMillen Delta Area, Eddy County, New	Sediment-Water Interface as a Mechanism for Nitrogen Losses from Lakes,
W75-10923 2K	Mexico,	W75-10902 50
NEBRASKA	W75-10941 · 3B	***************************************
Distribution-System Operation Analysis Model,	A property of the party of the U.S.	Some Studies on Nitrification in the Activated
W75-11180 5D	Estimated Mean-Monthly and Annual Runoff	Sludge Process,
ATTRACTO	at Selected Sites in the Pojoaque River	W75-10961 5D
NERITIC A Survey of Fishes and Commercial Inver-	Drainage Basin, Santa Fe County, New Mex-	Nitrogen Removal in a Pilot Plant,
tebrates of the Nearshore and Estuarine Zone	ico, W75-10943 2E	W75-10984 5E
Between Cape Romano and Cape Sable,	11 10 10 10	The Post of Free American Free
Florida,	NEW YORK	The Effects of Free Ammonia and Free Nitrous Acid on the Nitrification Process,
W75-11189 2I	A Simple and Inexpensive Technique for	W75-11101 SE
ASSESSMENT AND CO.	Determining Colored Light Intensity Un-	
NETHERLANDS The Economic Impact of Pollution Abatement:	derwater,	NITROGEN
The Case of Water Pollution by Degradable Or-	W75-10919 7B	The Influence of Density and Nitrogen on the
ganic Matter,	Geochemical Reconaissance of Surficial	Outcome of Competition Between Two Annua
W75-11254 5G	Materials in the Vicinity of Shawangunk Moun-	Pasture Grasses (Hordeum Leporinum Link and Lolium Rigidum Gaud.),
	tain, New York,	W75-10889 3I
NETS	W75-10928 5A	
Use of Steelon-Net Veils for Protection of the	Streamflow in the New York Part of the	Nitrogenous Changes During the Settlement of
Hydro-Engineering Works Against Dreissena Polymorphia Pall.	Susquehanna River Basin.	Sewage, W75-11120 5I
W75-11033 5G	W75-10931 2E	W 75-11120
		Ammonia Excretion by Zooplankton and it
NETWORK DESIGN	Root:Shoot and Leaf Area Relationships of	Significance to Primary Productivity During
Australian Arid Zone Streangauging,	Macrophyte Communities in Chautauqua Lake,	Summer,
W75-11307 2E	New York, W75-11009 5C	W75-11187 50
NETWORKS		NITROGEN COMPOUNDS
Improved Design of Distribution Networks by	Utilization of Stream-Borne Phosphorus by	Stability of Nitrosamines in Samples of Lak
Minimum Route,	Cayuga Lake Phytoplankton,	Water, Soil, and Sewage,
W75-11175 . 4A	W75-11036 5C	W75-11019 51
Advanced Techniques in the Mathematical	Evidence of Atmospheric Transport of Ozone	Natural and Fertilizer Nitrogen in Streams an
Modeling of Water-Distribution Systems,	into Urban Areas.	Lakes.
W75-11183	W75-11169 5A	W75-11311 5

2J 2I

n, iC

lla w al

5C

a ige

the for 5C ted 5D 5D 5D 5D

the nual ink

3F t of 5D its rring 5C SB and 5B

NITROGEN REMOVAL	NUTRIENT REMOVAL	OIL DISPERSANTS
Nitrogen Removal by Catalyst-Aided Break-	Concurrent Nitrification-Denitrification at the	The Effects of Crude Oils and the Dispersant
point Chlorination,	Sediment-Water Interface as a Mechanism for	Corexit 8666 on Sea Urchin Gametes and Emb-
W75-10965 5D	Nitrogen Losses from Lakes,	ryos,
	W75-10902 5C	W75-11090 5C
NITROGEN REMOVAL RATES	Physical amical Treatment of Westernater Con	The Effects of Oil Dispersents on the Cell in
Nitrogen Removal in the Operation of the	Physiochemical Treatment of Wastewater-Sea- water Mixture by Electrolysis,	The Effects of Oil Dispersants on the Cell in Fertilization and Development,
Mililani Sewage Treatment Plant,	W75-10979 5D	W75-11091 5C
W75-11041 5D		77.5 11051
NITROSAMINES	Desirable Provision in Current Designs for Fu-	OIL INDUSTRY
Stability of Nitrosamines in Samples of Lake	ture Development in Relation to Reclamation	Subsurface Water Tool for Petroleum Ex-
Water, Soil, and Sewage,	of Effluent,	ploration,
W75-11019 5B	W75-10980 5D	W75-11289 4B
	NUTRIENT REQUIREMENTS	OIL POLLUTION
NITROUS ACID	A Contribution to the Biology of Nitella	Oil Pollution and Seabirds in Denmark 1935-
The Effects of Free Ammonia and Free	Hookeri A. BR. in the Rotorua Lakes, New	1968,
Nitrous Acid on the Nitrification Process,	Zealand. II. Organic Nutrients and Physical	W75-10893 5C
W75-11101 5D	Factors,	Water Conservation in Sweden: III. Current
NON-POINT POLLUTANT SOURCES	W75-11235 5C	Trends.
Water Pollution from Nonpoint Sources,	OAK CREEK POWER PLANT (WIS)	W75-10987 5G
W75-11158 5B	Investigation of the Influence of Thermal	1175 10701
W/3-11136	Discharge from a Large Electric Power Station	Oil Separator with Coalescing Media,
NON-STRUCTURAL ALTERNATIVES	on the Temperature and Near-Shore Circula-	W75-11071 5G
Prescriptive Economic Models for Nonstruc-	tion of Lake Michigan,	Influence of Oil on Nucleic Acids of Algae,
tural Flood Control,	W75-11190 5C	W75-11080 5C
W75-11060 6F	OCEANOGRAPHIC TEMPERATURE SENSORS	W/3-11000 SC
	Note on the Measurement of the Response of	Influence of Oil on Nucleic Acids of Algae,
NONLINEAR PROGRAMMING	Oceanographic Temperature Sensors,	W75-11232 5C
An Implicit Approach to Pricing Agricultural	W75-11146 7B	OIL SPILLS
Water Transfers to Urban Uses,		Oil Spill Technology,
W75-11178 4A	OCEANS	W75-11001 5G
NORTH ATLANTIC	Some Observations on Behavior of the Treated	,
Weyl's Theory of Glaciation Supported by	Sewage Disposed in the Sea, W75-11020 5B	OIL WASTES
Isotopic Study of Norwegian Core K 11,	W /3-11020 3B	Effects of Some Components of Crude Oil on
W75-11153 2J	ODOR	Young Coho Salmon,
-	Biological Control: Isolation and Bacterial Ox-	W75-11088 5C
NORWEGIAN SEA	idation of the Taste-and-Odor Compound	OIL WELLS
Weyl's Theory of Glaciation Supported by	Geosmin,	How to Seal Tubing Collar Leaks.
Isotopic Study of Norwegian Core K 11,	W75-11013 5F	W75-11287 8C
W75-11153 2J	ODOR-PRODUCING ALGAE	OPTATIONA
NOZZLES	Biological Control: Isolation and Bacterial Ox-	OKLAHOMA Wind Effects on Chemical Films for Evapora-
Nozzle Hydraulics in the Trickle Irrigation	idation of the Taste-and-Odor Compound	tion Suppression at Lake Hefner,
SystemRelation Between Water Temperature	Geosmin,	W75-10920 3B
and Nozzle Flow Rate (In Japanese),	W75-11013 5F	
W75-11096 3F	ODORS	Hydraulic Modeling of Mixing Phenomena in
	Wastewater Treatment Plant Odors: A Continu-	Stratified Lakes,
NUCLEAR EXPLOSIONS	ing Enigma,	W75-11043 2H
Quality of Water in Aquifers of the Amargosa	W75-10986 5D	Improved Design and Operating Criteria for
Desert and Vicinity, Nevada,		Rural Water Districts,
W75-10932 5B	OFFSETS	W75-11056 6D
NUCLEIC ACIDS	Cavitation Control by Aeration of High-	OI ICOTROPHY
Influence of Oil on Nucleic Acids of Algae,	Velocity Jets, W75-11152 8B	OLIGOTROPHY A General Description of the Oligotrophic Lake
W75-11080 5C	W 75-11152	Paajarvi, Southern Finland, and the Ecological
30	OGALLALA AQUIFER	Studies on It,
Influence of Oil on Nucleic Acids of Algae,	Colorado City Solves Its Sand Pumping	W75-11229 5C
W75-11232 5C	Problems,	
	W75-11261 8C	OMAHA (NEB)
NUISANCE ALGAE	OIL	Distribution-System Operation Analysis Model, W75-11180 5D
Algae in Baltimore's Reservoirs,	How Downhole Temperatures, Pressures Af-	W 75-11180
W75-11221 5C	fect Drilling; Part 6: Correlating Geopressure	ON-SITE DATA COLLECTIONS
NUMERICAL ANALYSIS	Gradients with Hydrocarbon Accumulations,	Investigation of the Influence of Thermal
Thermal Response of Heated Streams, Solution	W75-11296 8G	Discharge from a Large Electric Power Station
by the Implicit Method,	How Downhole Temperatures, Pressures Af-	on the Temperature and Near-Shore Circula-
W75-10909 5B	fect Drilling: Part 7: The Shale Resistivity Ratio	tion of Lake Michigan, W75-11190 5C
	- A Valuable Tool for Making Economic	# /3-11190 SC
Implicit Numerical Modeling of Unsteady	Drilling Decisions,	ON-SITE INVESTIGATIONS
Flows,	W75-11297 8G	Field Testing of Aquatic Herbicides for Control
W75-10925 8B		of Egeria Densa,
NUMERICAL METHODS	How Downhole Temperatures, Pressures Af- fect Drilling; Part 8: Needless Spending of	W75-11200 5G
A Three-Dimensional Model for Estuaries and	Drilling and Exploration Money Can Be Pre-	Basic Concepts and Practical Aspects of Corro-
Coastal Seas: Vol. II, Aspects of Computation,	dicted-And Prevented,	sion Investigation,
W75-10900 2L	W75-11298 8G	W75-11271 8G

ON-SITE TESTS

ON-SITE TESTS Specific Conductance Method for in Situ Esti-	Ground Water in the Corvallis-Albany Area, Central Willamette Valley, Oregon,	ORIFICES Predicting Cavitation in Sudden Enlargements,
mation of Total Dissolved Solids, W75-11167 5A	W75-10940 2F	W75-11151 8B
	Strategic Approach to Estuarine Environmental	OSCILLATORY FLOW
OPEN CHANNEL FLOW Implicit Numerical Modeling of Unsteady	Management, W75-11179 2L	Transition in Oscillatory Flow Over Rippled
Flows,		Beds, W75-11149 8B
W75-10925 8B	Ammonia Excretion by Zooplankton and its Significance to Primary Productivity During	W/5-11149
Effect of Pressure Gradient on Wind-Waves in	Summer.	OUTLET WORKS
a Laboratory Channel,	W75-11187 5C	Cavitation Control by Aeration of High-
W75-11093 8B	Dissipation of Residues of Phenoxy Herbicides	Velocity Jets, W75-11152 8B
The Design of Storm Water Drainage Channels	Applied to the Watershed,	
Using Mathematical Model Techniques,	W75-11213 5B	OUTLETS
W75-11150 8B	ORGANIC CARBON	Design of the Optimal Outfall System for a Stream Receiving Thermal and Organic Waste
Laboratory Investigation of One-Dimensional	In Situ Measurement of the Settling Velocity	Discharges,
Wave Motion in Open Channels,	Profile of Particulate Organic Carbon in Lake	W75-11137 5B
W75-11172 8B	Ontario, W75-11227 5C	OVERFLOW
OPERATING COSTS		YWA Plan for Cleaner Rivers,
The Economy of Various Methods for De-	ORGANIC COMPOUNDS	W75-11017 5D
watering Sludge From Biological Purification	The Mechanism of Flocculation Processes in the Presence of Humic Stubtances,	OVERLAND FLOW
(Ueber die Wirtschaftlichkeit verschiedener Verfahren zur Entwaesserung von	W75-10958 5D	OVERLAND FLOW Derivation of Surface Water Lag Time for Con-
biologischem Klaerschlamm),		verging Overland Flow,
W75-11127 5D	Studies on Toxicity of Sodium Nifurstyrenate (NFS-NA) in Cultured Yellowtail (In	W75-11156 2E
OPERATION AND MAINTENANCE	Japanese),	OXIDATION
Sprinkler Irrigation Practice, (La Pratique De	W75-11034 5C	Carbon Regeneration by Wet Air Oxidation,
L'Irrigation Par Aspersion),	Effects of Some Components of Crude Oil on	W75-10988 5D
W75-10875 3F	Young Coho Salmon,	TO COLUMN TO BOTH TO THE PARTY OF THE PARTY
Considerations for Preparation of Operation	W75-11088 5C	How Silica Affects Iron Removal from Groundwater,
and Maintenance Manuals,	Oxidation of Organic Compounds in Water	W75-11016 5F
W75-11317 5D	(Oxidation organischer Verbindungen in	4 2 4 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
OPERATIONS	Wasser), W75-11118 5D	Measures of Biodegradability and Refractory Organics in Wastewaters: (Analysis, Interpreta-
Distribution-System Operation Analysis Model,	W/5-11118	tion, and Application of Measurement
W75-11180 5D	Apparatus for Concentration of Volatile Or-	Techniques),
Advanced Techniques in the Mathematical	ganic Pollutants in Water, W75-11342 5A	W75-11103 5D
Modeling of Water-Distribution Systems, W75-11183 4A		Investigations on the Long Term Biochemical
W75-11183 4A	ORGANIC MATTER	Oxidation of Sewage,
Can a Computer Really Operate a Water-Filtra-	The Use of Soil as a Purifying System (L'Utilisation du sol Comme Systeme Epu-	W75-11116 5D
tion Plant, W75-11184 5F	rateur),	Oxidation of Organic Compounds in Water
	W75-11126 5D	(Oxidation organischer Verbindungen in
OPERATIONS RESEARCH	Dissolved Organic Matter and Lake Metabol-	Wasser),
Floodplain Land-Use Management: An Appli- cation of Operations Research Methodology,	ism,	W75-11118 5D
W75-11037 6F	W75-11188 5C	Basic Concepts and Practical Aspects of Corro-
OPTICAL PROPERTIES	Preliminary Information on the Nature of Or-	sion Investigation,
A Simple and Inexpensive Technique for	ganic Matter in the Surface Sediments of Lakes	W75-11271 8G
Determining Colored Light Intensity Un-	Huron, Erie, and Ontario, W75-11240 2J	OXYGEN
derwater, W75-10919 7B		First Stage of the World's Largest Pure Oxygen
W 75-10919 7B	The Economic Impact of Pollution Abatement: The Case of Water Pollution by Degradable Or-	Sewage Plant to Undergo Test. W75-10960 5D
OPTIMIZATION	ganic Matter,	W/3-10900
Study of Criteria and Models Establishing Op- timum Level of Hydrogeologic Information for	W75-11254 5G	OXYGEN DEMAND
Groundwater Basin Management,	ORGANIC PESTICIDES	Application of the Manometric Technique in the Study of Sediment Oxygen Depletion,
W75-11042 2F	Absorption and Elimination of Photodieldrin by	W75-11222 50
Upgrading Meat Packing Facilities to Reduce	Daphnia and Goldfish,	
Pollution. (Part 3). Choosing the Optimum	W75-11085 5B	OXYGEN SAG
Financial Strategy,	ORGANIC WASTES	Application of the Manometric Technique in the Study of Sediment Oxygen Depletion,
W75-11322 5D	Wastewater Treatment Using Algae and Ar-	W75-11222 50
OPTIMUM DEVELOPMENT PLANS	temia, W75-10967 5D	OVECENATION
Legal and Institutional Problems in the		OXYGENATION Huntingdon Research Centre Pasveer Oxida
Management of Salinity, W75-11047 5G	Wastewater Treatment Plant, W75-11076 5D	tion PlantSix Years On,
	At I de l'altre de	W75-11115 5E
OREGON	ORGANOCHLORINE INSECTICIDES	OYODO RIVER (JAPAN)
The Minor and Trace Elements, Gas, and Isotope Compositions of the Principal Hot	Toxaphene Effects on Growth and Bone Com- position of Fathead Minnows, Pimephales	A Planning of Catchment Sewerage for Oyodo
Springs of Nevada and Oregon,	Promelas,	River (In Japanese),
W75-10937 2K	W75-11026 5C	W75-11113 SI

PAS T

PESTICIDE REGISTRATION

	•	
OYSTERS	Pasture Grasses (Hordeum Leporinum Link	Process Studies and Modeling of Self-Cleaning
A Reevaluation of the Combined Effects of	and Lolium Rigidum Gaud.),	Capacity of Mountain Creeks for Recreation
Temperature and Salinity on Survival and	W75-10889 3F	Planning and Management,
Growth of Bivalve Larvae Using Response		
Surface Techniques,	PATENTS	W75-11055 5B
W75-11081 5C	Device for Automatic Determination of	The Use of Snakes as a Pollution Indicator
W 73-11001	Suspended Solids Content in Water,	Species.
Uptake of Cadmium, Zinc, Copper, Lead and	W75-11063 5A	
Chromium in the Pacific Oyster, Crassostrea	1175-11005 SA	W75-11089 5B
	Process for Treating Sewage Sludge,	Evidence of Atmospheric Transport of Occasi
Gigas, Grown in the Tamar River, Tasmania,	W75-11064 5D	Evidence of Atmospheric Transport of Ozone
W75-11086 5B	W 75-11004	into Urban Areas,
Till to of Occasional Control of	System for Softening and Dealkalizing Water	W75-11169 5A
Effects of Ozone-Treated Seawater on the	by Electrodialysis,	
Spawned, Fertilized, Meiotic, and Cleaving	W75-11065 5F	Solid Wastes, Animal Refuse, and Organic
Eggs of the Commercial American Oyster,	W 75-11005	Residues Disposal, and the Quality of Ground
W75-11256 5C	Process for Treating Industrial Wastes,	Water,
		W75-11244 5B
OZONE	W75-11066 5D	
Water and Wastewater Disinfection with	Process for Treating Industrial Wastes,	Fertilizer Phosphate in Streams and Lakes,
Ozone: A Critical Review,	W75-11067 5D	W75-11310 5B
W75-10956 5D	W 75-11007	
	Electrolytic Sea Water Process,	Natural and Fertilizer Nitrogen in Streams and
Ozone Treatment Licks Color Problem.		Lakes,
W75-10959 5D	W75-11068 3A	W75-11311 5B
	Acrobic Lancas Wests Treatment Sustant and	
Water Treatment by Ozone, (In Japanese),	Aerobic Lagoon Waste Treatment System and	PATHOGENIC ANOEBIC
W75-11107 5D	Method,	Pathogenic Free-Living Amoebae in Arkansas
30	W75-11069 5D	
Evidence of Atmospheric Transport of Ozone	Control for Order 1 2 Control	Recreational Waters,
into Urban Areas,	System for Optimal Pressure Control in a	W75-11053 5A
	Multi-Stage Evaporation Unit,	
W75-11169 5A	W75-11070 3A	PATHOGENIC BACTERIA
Fff (O T) S		Pathogenic Free-Living Amoebae in Arkansas
Effects of Ozone-Treated Seawater on the	Oil Separator with Coalescing Media,	Recreational Waters,
Spawned, Fertilized, Meiotic, and Cleaving	W75-11071 5G	W75-11053 5A
Eggs of the Commercial American Oyster,		
W75-11256 5C	Process for Raw Water Clarification,	PEAK DISCHARGE
	W75-11072 5F	Flood Runoff from Urban Areas.
PACIFIC NORTHWEST US		W75-10904 5B
The Hydrologic CycleAs Applicable to the	Mobile Unit for Treating Liquid Waste,	W 73-10904 3B
Pacific Northwest,	W75-11073 5D	PEAK WATER DEMAND
W75-10949 7C		
1175 10717	Low Temperature Water Purification System,	Water Application Practices and Landscape At-
Algae Control in Northwest Reservoirs,	W75-11074 5F	tributes Associated with Residential Water
W75-11231 5G		Consumption,
W15-11251	Beach Erosion Control Structure,	W75-11059 3D
PACIFIC OCEAN	W75-11075 8A	
		PENETRATION
Near-Bottom Chemistry in the Eastern Pacific	Wastewater Treatment Plant,	'Self-Tapping Screw' Bit Would Use Lighter
and North Atlantic Oceans,	W75-11076 5D	Weights,
W75-10923 2K		W75-11283 8C
American Proposition for Transferration and In-	Flocculation Device for Waste Fluid Treat-	
Ammonia Excretion by Zooplankton and its	ment,	PENNSYLVANIA
Significance to Primary Productivity During	W75-11077 5D	Dissipation of Phenoxy Herbicides Applied to
Summer,	113 11077	Riparian Vegetation,
W75-11187 5C	PATH OF POLLUTANTS	
D. OFFIC CHORES	Occurrence of 2, 4, 5-T and Picloram in Sur-	W75-11214 5B
PACIFIC OYSTER	face Runoff Water in the Blacklands of Texas.	PERCOLATING WATER
Uptake of Cadmium, Zinc, Copper, Lead and	W75-10895 5B	Uranium Mineralization by Ground Water in
Chromium in the Pacific Oyster, Crassostrea	11 /3-10023 3B	
Gigas, Grown in the Tamar River, Tasmania,	Thermal Response of Heated Streams, Solution	Sedimentary Rocks, Japan.
W75-11086 5B	by the Implicit Method,	W75-11145 2F
	W75-10909 5B	BEDIBUYTON
PADRE ISLAND	11 (J-1030)	PERIPHYTON
Stabilization and Reconstruction of Texas	Surface Tension Reductions and Urban Wastes	Use of Productivity of Periphyton to Estimate
Coastal Foredunes with Vegetation,	in The New York Bight,	Water Quality,
W75-10887 2L		W75-10936 5B
al.	W75-10927 5B	Table 1 and 1 and 1 and 1 and 1 and 1
PARTICLE SIZE	Use of Productivity of Periphyton to Estimate	The Growth of Some Epiphytic Algae in a Lake
Stochastic Analysis of Particle Movement Over	Water Quality,	Receiving Thermal Effluent,
a Dune Bed,		W75-11225 5C
W75-10942 2J	W75-10936 5B	
23	Stability of Nitrosamines in Samples of Lake	PERMAFROST
Size-Sorting During Suspension Transporta-	Water, Soil, and Sewage,	How BP Alaska Cements Through Permafrost.
tion-Lognormality and Other Characteristics,	W75-11019 5B	W75-11278 8F
W75-11162 2J	W/3-11019 3B	
23	Some Observations on Behavior of the Treated	PERMITS
PASTURE MANAGEMENT	Sewage Disposed in the Sea,	Water Conservation in Sweden: III. Current
Generation of Arid Zone Rainfall and Runoff,	W75-11020 5B	Trends,
****	W 13-11020 3B	W75-10987 5G
W75-11303 2A	Preliminary Investigations into Copper Cycling	30
PASTURES		PESTICIDE REGISTRATION
	in Indian Lake, Massachusetts: A Lake Treated	Criteria for Herbicide Evaluation.
The Influence of Density and Nitrogen on the	Annually with Copper Sulfate,	
Outcome of Competition Between Two Annual	W75-11039 5B	W75-11196 5G

n

c

5D

do 5D

PESTICIDE RESIDUES

PESTICIDE RESIDUES	PHREATIC LINES	PIPES
Registration of Herbicides for Aquatic Use, W75-11197 5G	Application of Electrical Analogy to Draw Flow Nets for Sudden Drawdown Conditions in	Improved Design of Distribution Networks by Minimum Route,
	Earth Dams,	W75-11175 4A
Dissipation of Residues of Phenoxy Herbicides Applied for Water Milfoil Control in Large	W75-11143 8B	Finite-Element Method for Water-Distribution
Reservoirs,	PHREATOPHYTES	Networks,
W75-11198 5B	An Appraisal of Potential Water Salvage in the	W75-11186 4A
Dissipation of Residues of Phenoxy Herbicides	Lake McMillen Delta Area, Eddy County, New	Special Annulus Fluid Eases Casing Recovery,
Applied to the Watershed,	Mexico,	W75-11282 80
W75-11213 5B	W75-10941 3B	WHEN THE A PARTY INC.
Dissipation of Phenoxy Herbicides Applied to	PHYLLODOCE MACULATA	PITLESS ADAPTERS Pitless Adapters: Emphasis on Sanitation,
Riparian Vegetation,	Some Effects of Copper on the Polychaete	W75-11258 80
W75-11214 5B	Phyllodoce Maculata,	1175-11250
	W75-11136 5C	PITTING (CORROSION)
Extraction and Analytical Techniques for Pesti-	PHYSICO-CHEMICAL TREATMENT	Predicting Cavitation in Sudden Enlargements,
cides in Soil, Sediment, and Water, W75-11236 5A	Physiochemical Treatment of Wastewater-Sca-	W75-11151 8F
W75-11236 5A	water Mixture by Electrolysis,	Longer Life for Submersibles.
PESTICIDES	W75-10979 5D	W75-11259 80
Standard Curves for Nuvacron, Malathion,		PLANKTON
Sevin, DDT, and Kelthane Tested Against the	Simplified Waste Water Purification Through	The Influence of the Warm Cooling Water from
Mosquito Culex Pipiens L. and the	Physical-Chemical Treatment (Vereinfachte	a Fossil Fueled Power Plant on Oceanographic
Microcrustacean Daphnia Magna Straus, W75-11082 5B	Abwasserreinigung durch physikalisch chemische Behandlung),	Conditions and Composition of Plankton in
W15-11002	W75-11122 5D	Owase Bay I. Water Temperature in Relation to
РНАЕОРНҮТА	30	Distribution of Microplankton, (In Japanese),
The Accumulation of Cadmium, Copper, Man-	PHYTOPHTHORA	W75-11030 50
ganese and Zinc by Fucus Vesiculosus in the	Phytophthora Species in Arizona: Its Occur-	Seasonal Abundance of Crustacean Zooplank
Bristol Channel, W75-11083 5B	rence in Recycled Irrigation water,	ton and Net Plankton Biomass of Lakes Huron
W/3-11063	W75-10883 5A	Erie, and Ontario,
PHENOLOGY	PHYTOPLANKTON	W75-11238 50
Phenology of Selected Sonoran Desert Plants at	Utilization of Stream-Borne Phosphorus by	PLANNING
Punta Cirio, Sonora, Mexico. W75-10862 21	Cayuga Lake Phytoplankton,	Successful Irrigation: Preparation, Realization
W 73-10802	W75-11036 5C	Exploritation, (Savoir Irriguer: Preparation
PHENOLS	Bisshrome Analysis as a Method for Assessing	Realisation, Exploitation),
Endemic Nephrophathy and Its Relation to the	Biochrome Analysis as a Method for Assessing Phytoplankton Dynamics, Phase II,	W75-10874
Contamination of Well Water by Phenolic	W75-11052 5C	Water Resources,
Compounds in Barsa-Arad (Nefropatia En- demica Si Relatia Cu Impurificarea Prin Com-		W75-11003 50
pousi Fenolici in Apele Fintinilor Din Comuna	In Situ Measurement of the Settling Velocity	1 m : (C.)
Barsa-Arad),	Profile of Particulate Organic Carbon in Lake	A Planning of Catchment Sewerage for Oyodo
W75-11105 5B	Ontario, W75-11227 SC	River (In Japanese), W75-11113
Characteristic Determination of Phone in	W75-11227 5C	
Chromatographic Determination of Phenols in Water,	Quantitative Estimation of the Daily Ingestion	PLANT DISEASES
W75-11344 5A	of Phytoplankton by Tilapia Nilotica and	Comparison of Uredo Eichhorniae, the Water
	Haplochromis Nigripinnis in Lake George,	hyacinth Rust, and Uromyces Pontederiae, W75-11092 50
PHOSPHATES	Uganda, W75-11268 2H	
Some Observations Concerning Preparation and Storage of Stream Samples for Dissolved	W75-11268 2H	Utilization of Phytopathogens as Biocontrol
Inorganic Phosphate Analysis,	PICLORAM	for Aquatic Weeds, W75-11206 50
W75-11336 5A	Occurrence of 2, 4, 5-T and Picloram in Sur-	
Interference of Manage (II) in the Colorinatric	face Runoff Water in the Blacklands of Texas,	PLANT GROWTH
Interference of Mercury(II) in the Colorimetric Determination of Inorganic Phosphate in	W75-10895 5B	Phenology of Selected Sonoran Desert Plants at
Water,	PIEZOMETERS	Punta Cirio, Sonora, Mexico. W75-10862
W75-11340 5A	A Pneumatic System to Pump Water from	1 - 14
PHOSPHORIC ACID	Piezometers,	The Early Vegetative Growth of Two Annua
Use of Amendments to Reduce Water Require-	W75-11257 8C	Pasture Grasses (Hordeum Leporinum Link
ments for Stand Establishment of Small-Seeded	PINE HILL SWAMP (ILL)	and Lolium Rigidum Gaud.), W75-10876
Crops,	Seasonal Abundance and Diversity of Benthos	
W75-11045 3F	in a Southern Illinois, USA Swamp,	The Influence of Density and Nitrogen on the
PHOSPHORUS	W75-11312 2H	Outcome of Competition Between Two Annua Pasture Grasses (Hordeum Leporinum Link
Utilization of Stream-Borne Phosphorus by	DINE TREEC	and Lolium Rigidum Gaud.),
Cayuga Lake Phytoplankton,	PINE TREES Studies on the Relationship Between Dry-	W75-10889
W75-11036 5C	Matter Production and the Development of a	
PHOSPHORUS COMPOUNDS	Pine Forest on Coastal Sand Dunes (1), (In	The Germination and Establishment of Two
Fertilizer Phosphate in Streams and Lakes,	Japanese),	Annual Pasture Grasses (Hordeum Leporinum Link and Lolium Rigidum Gaud.),
W75-11310 5B	W75-11098 4A	W75-10897 2
	PINYON PINE TREES	
PHOTODIELDRIN Absorption and Elimination of Photodialdrin by	Effects of Pinyon-Juniper Removal on Natural	PLANT PATHOLOGY
Absorption and Elimination of Photodieldrin by Daphnia and Goldfish,	Resource Products and Uses in Arizona,	Comparison of Uredo Eichhorniae, the Water hyacinth Rust, and Uromyces Pontederiae,
W75-11085 5B	W75-10886 3B	W75-11092

PLANT PHYSIOLOGY	tion, and Application of Measurement	Conoco Technology Curbs Production Pollu-
Influence of Oil on Nucleic Acids of Algae, W75-11232 5C	Techniques), W75-11103 5D	tion, W75-11267 5G
The Role of Endogenous Abscisic Acid in the	Concentration and Genera of Algae in Selected	Upgrading Metal-Finishing Facilities to Reduce
Response of Plants to Stress, W75-11319 3F	Illinois Streams, 1971-1973, W75-11165 5A	Pollution. (Part 1). In-Process Pollution Abatement,
PLANTING MANAGEMENT	Evidence of Atmospheric Transport of Ozone	W75-11324 5D
The Early Vegetative Growth of Two Annual	into Urban Areas,	Upgrading Metal-Finishing Facilities to Reduce
Pasture Grasses (Hordeum Leporinum Link and Lolium Rigidum Gaud.),	W75-11169 5A	Pollution. (Part 2). Waste Treatment, W75-11325 5D
W75-10876 3F	Chelation Study of Copper (II): Fulvic Acid System,	Upgrading Textile Operations to Reduce Pollu-
Transplanting Sea Grass in Mississippi Sound, W75-11207 4A	W75-11219 5B	tion. (Part 1). In-Plant Control of Pollution. W75-11326 5D
PLASTIC DEFORMATION	Extraction and Analytical Techniques for Pesti-	
Theory of Plasticity of Porous Media with	cides in Soil, Sediment, and Water, W75-11236 5A	POLYCHAETES Some Effects of Copper on the Polychaete
Fluid Flow, W75-11276 8E	Interference of Mercury(II) in the Colorimetric	Phyllodoce Maculata, W75-11136 5C
BANDERS A TEC DEIDED	Determination of Inorganic Phosphate in	
A Pneumatic System to Pump Water from	Water,	POLYCHLORINATED BIPHENYLS Mutagens and Potential Mutagens in the Big
Piezometers,	W75-11340 5A	Mutagens and Potential Mutagens in the Bio- sphere: I. DDT and Its Metabolites,
W75-11257 8C	Modification of the Iodimetric Titration	Polychlorinated Biphenyls, Chlorodioxins,
POCILLOPORA MEANDRINA	Method for the Determination of Bromide and	Polycyclic Aromatic Hydrocarbons,
A Comparison of Effects of Elevated Tempera-	Its Application to Mixed Domestic-Industrial Waste Effluents.	Haloethers, W75-11170 5B
ture Versus Temperature Fluctuations on Reef Corals at Kahe Point, Oahu,	W75-11341 5A	
W75-11084 5C	Assessing for Consentration of Volutile Co.	POLYMERS Process for Treating Industrial Wastes,
	Apparatus for Concentration of Volatile Or- ganic Pollutants in Water,	W75-11066 5D
POLITICAL ASPECTS Institutional Arrangements for Reducing Con-	W75-11342 5A	Andreis of Protect Life and MANNES and
flict Over Water Quality in International	Interference of Sulfate Ion on SPADNS	Analysis of Factors Influencing Mobility and Adsorption in the Flow of Polymer Solution
Rivers, W75-11242 6E	(Sodium 2-(Sulfophenylazo)-1,8-Dihydrox- ynaphthalene-3,6-Disulfonate) Colorimetric	Through Porous Media, W75-11275 8B
POLLUTANT IDENTIFICATION	Determination of Fluorine in Waste Waters,	
Epifaunal Invertebrates as Indicators of Water	W75-11343 5A	PONDS Limnology of Desert Ponds,
Quality in Southern Lake Pontchartain,	Chromatographic Determination of Phenols in	W75-10880 2H
W75-10852 5C	Water,	POROSITY
Phytophthora Species in Arizona: Its Occur-	W75-11344 5A	Theory of Plasticity of Porous Media with
rence in Recycled Irrigation water, W75-10883 5A	POLLUTANT IDENTIFICATIONS	Fluid Flow, W75-11276 8E.
Constantal Bosoniana of Sufficial	Retention of Cadmium in Mice Studied by	
Geochemical Reconaissance of Surficial Materials in the Vicinity of Shawangunk Moun- tain, New York,	Whole Body Autoradiography, W75-11024 5A	Formulation of Boundary Conditions at the
W75-10928 5A	POLLUTANTS	Surface of a Porous Medium, W75-11269 8B
Activated Carbon in the Water Treatment	Water Pollution from Nonpoint Sources, W75-11158 5B	
Plant,	W75-11158 5B	PORTUGAL (RIO SADO) Experimental Study of the Cooling Water
W75-10992 5D	Translations on Environmental Quality, No. 33.	System, Setubal Power Plant, Rio Sado, Portu-
Minitest Method for Monitoring Effluent Quali-	W75-11246 5G	gal,
ty,	POLLUTION	W75-10855 5B
W75-10994 5D	Pitless Adapters: Emphasis on Sanitation, W75-11258 8C	POST AUDIT ANALYSIS
Advances in the Detection of Water Pollutants,	W75-11258 8C	Social Impacts of Water Resources Develop- ments and Their Implication for Urban and
W75-10995 5A	POLLUTION ABATEMENT	Rural Development: A Post Audit Analysis of
Pathogenic Free-Living Amoebae in Arkansas	A New Look at Pollution Prevention on Lowland Rivers.	the Weber Basin Project in Utah,
Recreational Waters,	W75-11132 5G	W75-10854 6B
W75-11053 5A	Translations on Environmental Quality, No. 33.	POST-IMPOUNDMENT
Device for Automatic Determination of Suspended Solids Content in Water,	W75-11246 5G	The Effects of the Formation of Lake Kainji (Nigeria) Upon the Indigenous Fish Population.
W75-11063 5A	Economic Analysis of Effluent Guidelines:	W75-11223 5C
Mercury Contents in Biologically Preserved	Meat Packing Industry,	POTABLE WATER
Specimens of Menuke (Sebastes Baramenuke and S. Flammeus),	W75-11249 5G Economic Analysis of Effluent Guidelines. Fer-	Facing the Real Cost of Clean Water, W75-10857 5G
W75-11078 5A	roalloys Industry.	The Impact of the Safe Drinking Water Act on
Continuous Automatic Monitoring of Surface	W75-11250 5G	Utilities,
Water with Fish,	The Economic Impact of Pollution Abatement:	W75-10859 5G
W75-11079 5A	The Case of Water Pollution by Degradable Or-	Disinfecting Wastewater with Chlorina-
Measures of Biodegradability and Refractory	ganic Matter,	tion/Dechlorination Part 2,
Organics in Wastewaters: (Analysis, Interpreta-	W75-11254 5G	W75-10964 5D

G

al ak

he ial nk

3F wo im 21

er-

POTABLE WATER

Preventing Backflow in Piping Cross Connec-	Dissolved Gas Supersaturation and Dilution in	PROBABILITY
tions,	Thermal Plumes from Steam Electric Generat-	Relative Importance of Decision Variables in
W75-11018 5B	ing Stations, W75-11159 5B	Flood Frequency Analysis, W75-10929 4A
Endemic Nephrophathy and Its Relation to the		77
Contamination of Well Water by Phenolic	PRAIRIE RATTLESNAKES	Some Observations on Rainfall in Western
Compounds in Barsa-Arad (Nefropatia En-	The Use of Snakes as a Pollution Indicator	New South Wales,
demica Si Relatia Cu Impurificarea Prin Com-	Species,	W75-11304 2B
pousi Fenolici in Apele Fintinilor Din Comuna	W75-11089 5B	BRODUCTIVITY
Barsa-Arad),	MANAGEMENT AND A STREET OF THE STREET	PRODUCTIVITY
W75-11105 5B	PRECIPITATION (ATMOSPHERIC)	Man's Impact on a Newly Formed Reservoir,
	Analysis of Colorado Precipitation,	W75-11233 5C
Water Treatment for Public Supply,	W75-11040 2B	PROJECT PLANNING
W75-11119 5F	PRESERVATION	Successful Irrigation: Preparation, Realization,
Aquatic Plant Control Using Herbicides in a	Preserving Activated Sludge,	Exploritation, (Savoir Irriguer: Preparation,
Large Potable Water Supply,	W75-10962 5D	Realisation, Exploitation),
W75-11201 5G	1175 10702	W75-10874 3F
W/3-11201	PRESSURE	
POTASSIUM COMPOUNDS	Simple Field Checks Will Provide Accurate	PROPERTY VALUES
Tests Show Potassium Mud Versatility,	DST Data,	Covariance Analysis of Reservoir Development
W75-11284 8G	W75-11281 8G	Effects on Property Tax Base,
		W75-10851 6B
POTASSIUM DICHROMATE	How to Find Transition Zones in Soft Forma-	
Determination of Chemical Oxygen Demand,	tions,	A Case Study of Some Economic Aspects of
COD(Cr), in Waste Waters of Pulp and Paper	W75-11285 8G	the National Flood Insurance Program,
Mills (Bestimmung des chemischen Sauerstoff-	C in Control Way 177	W75-10906 · 6F
bedarfes, CSB(Cr), in Restabwaessern von	Casing-Seat Testing - Why and How,	PROTOZOA
Zellstoff und Papierfabriken).	W75-11291 8F	Population Dynamics of Protozoa in Waste-
W75-11337 5A	How Downhole Temperatures, Pressures Af-	water,
	fect Drilling; Part 4: Pitfalls in Overpressure	W75-10957 5D
POTASSIUM LIGNITE	Prediction,	W 75-10957
Tests Show Potassium Mud Versatility,	W75-11294 8G	The Role of Planktonic Protozoa in the Marine
W75-11284 8G		Food Chain. Seasonal Changes, Relative
BOT LEGE	How Downhole Temperatures, Pressures Af-	Abundance, and Cell Size Distribution of Tin-
POTATOES	fect Drilling; Part 5: Predicting Hydrocarbon	tinnida,
The Effect of Irrigation on the Yield and Quali-	Environments with Wireline Data,	W75-11191 5C
ty of Maincrop Potatoes,	W75-11295 8G	
W75-11106 3F		PUBLIC HEALTH
POUDRE VALLEY (COL)	How Downhole Temperatures, Pressures Af-	A Waterborne Gastroenteritis Epidemic in Picc
Consolidation and Rehabilitation of Canals in	fect Drilling; Part 6: Correlating Geopressure	Rivers, California,
Poudre Valley,	Gradients with Hydrocarbon Accumulations,	W75-11005 SF
W75-11061 4A	W75-11296 8G	Endemic Nephrophathy and Its Relation to the
W/3-11001 4A	PRESSURE-DEPTH GRADIENT	Contamination of Well Water by Phenolic
POULTRY	How Downhole Temperatures, Pressures Af-	Compounds in Barsa-Arad (Nefropatia En-
Upgrading Poultry-Processing Facilities to	fect Drilling; Part 6: Correlating Geopressure	demica Si Relatia Cu Impurificarea Prin Com-
Reduce Pollution. (Part 1). In-Process Pollution	Gradients with Hydrocarbon Accumulations,	pousi Fenolici in Apele Fintinilor Din Comuni
Abatement,	W75-11296 8G	Barsa-Arad),
W75-11328 5D		W75-11105 5E
	PRESSURE EFFECTS	
Upgrading Poultry-Processing Facilities to	Predicting Cavitation in Sudden Enlargements,	PUBLIC LAW 92-500
Reduce Pollution. (Part 2). Pretreatment of	W75-11151 8B	Milestone Water Legislation Accompanied by
Poultry-Processing Wastes,	MD CONIC	Millstone of Bureaucratic Red Tape,
W75-11329 5D	PRICING	W75-11007 50
Upgrading Poultry-Processing Facilities to	An Implicit Approach to Pricing Agricultural Water Transfers to Urban Uses,	PUBLIC UTILITIES
Reduce Pollution. (Part 3). Waste Treatment.	W75-11178 4A	Water System Accessories,
W75-11330 5D	4A	W75-11299 80
	PRIMARY PRODUCTIVITY	11/3-112/
POULTRY PROCESSING WASTES	Seasonal Variation in Composition, Plant	PUBLICATIONS
Upgrading Poultry-Processing Facilities to	Biomass, and Net Primary Productivity of a	The Awareness of the Relevant Water
Reduce Pollution. (Part 1). In-Process Pollution	Tropical Grassland at Kurukshetra, India,	Resources Literature by the Personnel of the
Abatement,	W75-11006 2I	Wisconsin Department of Natural Resources,
W75-11328 5D		W75-10899 100
	The Influence of the Warm Cooling Water from	
Upgrading Poultry-Processing Facilities to	a Fossil Fueled Power Plant on Oceanographic	Considerations for Preparation of Operation
Reduce Pollution. (Part 2). Pretreatment of	Conditions and Composition of Plankton in	and Maintenance Manuals,
Poultry-Processing Wastes, W75-11329 5D	Owase Bay I. Water Temperature in Relation to	W75-11317 5E
W75-11329 5D	Distribution of Microplankton, (In Japanese),	PUERTO RICE
Upgrading Poultry-Processing Facilities to	W75-11030 5C	Water Hyacinth Research in Puerto Rico,
Reduce Pollution. (Part 3). Waste Treatment.	The Accumulation of Cadmium, Copper, Man-	W75-11215 50
W75-11330 5D	ganese and Zinc by Fucus Vesiculosus in the	
30	Bristol Channel,	PULP AND PAPER INDUSTRY
POWERPLANTS	W75-11083 5B	Measures in the Sulfite Pulp Industry fo
Experimental Study of the Cooling Water		Decreasing Waste Water Load (Massnahmer
System, Setubal Power Plant, Rio Sado, Portu-	Primary Production in Lakes Ontario and Erie:	der Sulfitzellstoff-Industrie zur Minderung de
gal,	A Comparative Study,	Abwasserbelastung),
W75-10855 5B	W75-11217 5C	W75-11339 5I

B(ritish) C(olumbia) Presses for Forest Indus-	PURIFICATION	Generation of Arid Zone Rainfall and Runoff,
tries CleanaUp.	The Use of Soil as a Purifying System	W75-11303 2A
W75-11350 5G	(L'Utilisation du sol Comme Systeme Epu-	RANGE GRASSES
PULP WASTES	rateur), W75-11126 5D	Salt and Specific Ion Effects on Germination of
Bark as Trickling-Filter Dewatering Medium		Four Grasses,
for Pulp and Paper Mill Sludge, W75-11241 5D	QUALITY CONTROL Colorado City Solves Its Sand Pumping	W75-10894 2K
W/3-112-1	Problems.	RANGE MANAGEMENT
Waste Water Survey, St. Regis Paper Com-	W75-11261 8C	The Influence of Rainfall on the Reproduction
pany, Cantonment, Florida.	P. P. CROP	of Sonoran Desert Lagomorphs,
W75-11314 5D	R FACTOR Drug Resistant Coliforms Call for Re-Evalua-	W75-10871 4A
Effluent Characteristics and Treatment of	tion of Water Quality Standards,	
Mechanical Pulping Effluents,	W75-11130 5B	Seasonal Variations in the Infiltration Rate of a
W75-11331 5D	BADIO ACTIVID DAGING	Whitehouse Soil in Southern Arizona, W75-10873 2G
Mill Experience in the Treatment of Mechani-	RADIOACTIVE DATING Determination of Regional Hydraulic Conduc-	20
cal Pulping Effluent,	tivity Through Use of C-14 Dating of Ground-	Salt and Specific Ion Effects on Germination of
W75-11332 5D	water,	Four Grasses,
Papermaking Complex at Dunaujvaros	W75-10930 2F	W75-10894 2K
(Hungary) Preserving the Danube (Au com-	RADIOACTIVE WASTES	Hydrologic Relations on Undisturbed and Con-
plexe papetier de Dunaujvaros preserver le	A Field Study of Physico-Chemical States of	verted Big Sagebrush Lands: The Status of Our
Danube),	Artificial Radionuclides in Seawater,	Knowledge,
W75-11333 5D	W75-11022 5B	W75-11313 4D
Determination of Chemical Oxygen Demand,	RADIOCHEMICAL ANALYSIS	RAPID BLOC PROCESS
COD(Cr), in Waste Waters of Pulp and Paper	A Field Study of Physico-Chemical States of	Nitrogen Removal in the Operation of the
Mills (Bestimmung des chemischen Sauerstoff-	Artificial Radionuclides in Seawater,	Mililani Sewage Treatment Plant,
bedarfes, CSB(Cr), in Restabwaessern von	W75-11022 5B	W75-11041 5D
Zellstoff und Papierfabriken). W75-11337 5A	RADIOGRAPHY	DATES OF ARRIVATION
#15-11557 SA	Retention of Cadmium in Mice Studied by	RATES OF APPLICATION Scheduling and Application Rates of Irrigation
Effect of Lime Treatment on Molecular Weight	Whole Body Autoradiography,	in a Humid Climate.
Distribution of Color Bodies from Kraft Liner- board Decker Effluents.	W75-11024 5A	W75-11048 · 3F
W75-11345 5D	RADIOISOTOPES	
	A Field Study of Physico-Chemical States of	Nozzle Hydraulics in the Trickle Irrigation
Biodegradation of Components of Pulp Waste	Artificial Radionuclides in Seawater,	SystemRelation Between Water Temperature and Nozzle Flow Rate (In Japanese),
Effluents by Bacteria. (1). Degradation of Kraft	W75-11022 5B	W75-11096 3F
Lignin (In Japanese), W75-11346 5B	RAIN GAGES	
	Aspects of Rainfall Measurement in a New En-	REAERATION
PUMP	gland Location,	Process Studies and Modeling of Self-Cleaning
A Pneumatic System to Pump Water from Piezometers.	W75-11309 2B	Capacity of Mountain Creeks for Recreation Planning and Management,
W75-11257 8C	RAINBOW TROUT	W75-11055 5B
The Control of the Co	Effect of DDT and M.S. 222 on Learning a	
PUMP TESTING	Simple Conditioned Response in Rainbow	RECARBONIZATION
Installing Submersibles. W75-11264 8C	Trout (Salmo gairdneri),	Liquid CO2 Protects our Water's Quality, W75-10990 5F
W15-11204	W75-11025 5C	W 75-10330
PUMPING	Acute Toxicity of Petrochemical Drilling Fluids	RECESSION CURVES
Deprivation Contribution and Interference Ef- fects of Multiple Wells in a Common Aquifer,	Components and Wastes to Fish,	Predicting Recessions Through Convolution,
W75-11142 4B	W75-11265 5C	W75-10917 2E
	RAINFALL	Moisture and Energy Conditions in a Draining
Colorado City Solves Its Sand Pumping	The Influence of Rainfall on the Reproduction	Soil Mass,
Problems, W75-11261 8C	of Sonoran Desert Lagomorphs,	W75-11054 2G
W/3-11201	W75-10871 4A	BECREATION
PUMPS	Some Observations on Rainfall in Western	RECREATION Pathogenic Free-Living Amoebae in Arkansas
Sprinkler Irrigation Practice, (La Pratique De	New South Wales,	Recreational Waters.
L'Irrigation Par Aspersion), W75-10875 3F	W75-11304 2B	W75-11053 5A
	Aspects of Rainfall Measurement in a New En-	
Pump Selection,	gland Location,	Man's Impact on a Newly Formed Reservoir, W75-11233
W75-11002 8C	W75-11309 2B	W75-11233 5C
A Solution to Pump Stoppages,	RAINFALL INTENSITY	RECYCLING
W75-11111 8C	The Influence of Rainfall on the Reproduction	Phytophthora Species in Arizona: Its Occur-
Longer Life for Submersibles.	of Sonoran Desert Lagomorphs,	rence in Recycled Irrigation water,
W75-11259 8G	W75-10871 4A	W75-10883 5A
	Derivation of Surface Water Lag Time for Con-	Total Waste Recycle System for Water Purifi-
Will Submersibles Make Jet Pumps Obsolete. W75-11263 8C	verging Overland Flow,	cation Plant Using Alum as Primary Coagulant,
W75-11263 8C	W75-11156 2E	W75-11094 5D
Installing Submersibles.	BAINEALI BUNGEE BELATIONOUTE	REFLECTANCE
W75-11264 8C	RAINFALL-RUNOFF RELATIONSHIPS Hydrologic Investigation and Design of Urban	The Utilization of Sun-Glint in a Study of Lake
Water System Accessories,	Stormwater Drainage Systems,	Dynamics,
W75-11299 8C	W75-11141 4A	W75-11239 5A

REFRACTIVITY

REFRACTIVITY	Could The Sea be Used to Store Water for	Water and Wastewater Disinfection with
Measures of Biodegradability and Refractory	SupplyA Possible Scheme,	Ozone: A Critical Review,
Organics in Wastewaters: (Analysis, Interpreta- tion. and Application of Measurement	W75-11129 4A	W75-10956 5D
tion, and Application of Measurement Techniques),	Water Level Manipulation: A Tool for Aquatic	Advances in the Detection of Water Pollutants.
W75-11103 5D	Weed Control,	W75-10995 5A
	W75-11216 4A	Water Treatment by Ozone, (In Japanese),
REGIONAL ADMINISTRATION	Algae in Baltimore's Reservoirs.	W75-11107 5D
The Water Industry in Transition, W75-11252 3E	W75-11221 5C	35
W/5-11252		Computer Systems and Water Resources,
REGIONAL DEVELOPMENT	Algae Control in Northwest Reservoirs,	W75-11174 6A
International Development Strategies for the	W75-11231 5G	Extraction and Analytical Techniques for Pesti-
Sahel.	Man's Impact on a Newly Formed Reservoir,	cides in Soil, Sediment, and Water,
W75-10861 4A	W75-11233 · 5C	W75-11236 5A
An Economic Analysis of the Pollution	RESIDENCE TIME	The Tendelte of Deillies Fluid Comments to
Problems in the Colorado River Basin: The	Subsurface Flow from Snowmelt Traced by	The Toxicity of Drilling Fluid Components to Aquatic Biological Systems, A Literature
Upper Main Stem Sub-Basin,	Tritium,	Review,
W75-11247 5G	W75-10921 2F	W75-11266 5C
REGRESSION ANALYSIS	DECOMPANY AND	
Estimated Mean-Monthly and Annual Runoff	RESISTIVITY Electrical Tests for Submersible Pumps,	RHIZOCTONIA SOLANI
at Selected Sites in the Pojoaque River	W75-11260 8G	Utilization of Phytopathogens as Biocontrols for Aquatic Weeds,
Drainage Basin, Santa Fe County, New Mex-	W 75-11200	W75-11206 5G
ico,	Making Log Analysts of Geologists.	W75-11200
W75-10943 2E	W75-11288 7C	RHODESIA
REGULATION	How Downhole Temperatures, Pressures Af-	Water Pollution Problems in Salisbury, Rhode-
Criteria for Herbicide Evaluation,	fect Drilling; Part 7: The Shale Resistivity Ratio	sia: Present and Future,
W75-11196 5G	- A Valuable Tool for Making Economic	W75-10983 5G
	Drilling Decisions,	Chemical-Biological Treatment With Biological
REHABILITATION	W75-11297 8G	Filters,
Guidelines for Revegetation and Stabilization	RESONANCE	W75-11123 5D
of Surface Mined Areas in the Western States, W75-11100 4D	Effects of Entrance Loss on Harbor Oscilla-	BHODORHYTA
W75-11100 4D	tions,	RHODOPHYTA Influence of Oil on Nucleic Acids of Algae,
REMOTE SENSING	W75-11147 8B	W75-11080 5C
The Utilization of Sun-Glint in a Study of Lake		W 75-11080
Dynamics,	RESOURCE ALLOCATION	RICE
W75-11239 5A	Non-Renewable, Non-Energy Resources, W75-11253 6B	Effects of Irrigation in Rain-Fed Fields on the
REPRODUCTION	W 73-11233	Growth and Yield of Upland Rice Varieties, (In
Establishing Alkali Sacaton on Harsh Sites in	RESPONSE TIME	Korean), W75-10853 3F
the Southwest,	Note on the Measurement of the Response of	W 75-10033
W75-10882 4A	Oceanographic Temperature Sensors,	Effect of Soil-Water Relations on the Root
RESEARCH AND DEVELOPMENT	W75-11146 7B	Porosity, Transpiration and Ion Uptake in Rice,
Aquatic Plant Research and Control in Florida,	RETENTION	W75-10916 3F
W75-11195 4A	Available Water-Holding Capacities of Soils in	RIPARIAN PLANTS
	Southern Idaho,	Dissipation of Phenoxy Herbicides Applied to
RESERVOIR CONSTRUCTION	W75-11140 2G	Riparian Vegetation,
Guidelines for the Identification of Potential	RETURN FLOW	W75-11214 5B
Environmental Impacts in the Construction and	Occurrence of 2, 4, 5-T and Picloram in Sur-	RIPPLED BED
Operation of a Reservoir, W75-11316 5C	face Runoff Water in the Blacklands of Texas,	Transition in Oscillatory Flow Over Rippled
	W75-10895 5B	Beds,
RESERVOIR OPERATION	Status of Waste Heat Utilization and Dual-Pur-	W75-11149 8B
Guidelines for the Identification of Potential	pose Plant Projects,	RISKS
Environmental Impacts in the Construction and	W75-11251 3E	The Economics of Flood Insurance: An Analy-
Operation of a Reservoir, W75-11316 5C	DEVECETATION	sis of the National Flood Insurance Program,
30	REVEGETATION Salt and Specific Ion Effects on Germination of	W75-11038 6F
RESERVOIR SITES	Four Grasses,	
Could The Sea be Used to Store Water for	W75-10894 2K	RIVER BASIN DEVELOPMENT International Development Strategies for the
SupplyA Possible Scheme,		Sahel.
W75-11129 4A	Guidelines for Revegetation and Stabilization	W75-10861 4A
RESERVOIR-STORAGE	of Surface Mined Areas in the Western States, W75-11100 4D	
A Practical Way to Find Minimum Drainage	40	RODENTS
Area for a Well,	REVERSE OSMOSIS	Retention of Cadmium in Mice Studied by
W75-11290 4B	Solute-Solute Interactions in Ultrafiltration	Whole Body Autoradiography, W75-11024 5A
RESERVOIR YIELD	Treatment of Paper Mill Wastes,	W 75-11024 5A
A Practical Way to Find Minimum Drainage	W75-11334 5D	ROMANIA (BARSA-ARAD)
Area for a Well,	REVIEWS	Endemic Nephrophathy and Its Relation to the
W75-11290 . 4B	Heavy Metals and Other Trace Elements,	Contamination of Well Water by Phenolic
RESERVOIRS	W75-10934 5B	Compounds in Barsa-Arad (Nefropatia En-
Two-Dimensional, Hydrostatic Simulation of	Review of Conference on Hydrology of Deep	demica Si Relatia Cu Impurificarea Prin Com- pousi Fenolici in Apele Fintinilor Din Comuna
Thermally-Influenced Hydrodynamic Flows,	Sedimentary Basins,	Barsa-Arad),
W75-10901 2H	W75-10935 5B	W75-11105 5B

ROOTS	Adaptation of Copepod Populations to Thermal	SCALING
Effect of Soil-Water Relations on the Root	Stress,	The Kinetics of Crystallization of Scale-Form-
Porosity, Transpiration and Ion Uptake in Rice,	W75-11046 5C	ing Minerals,
W75-10916 3F		W75-11273 8G
	A Reevaluation of the Combined Effects of	
Root:Shoot and Leaf Area Relationships of	Temperature and Salinity on Survival and	SCALING EFFECTS
Macrophyte Communities in Chautauqua Lake,	Growth of Bivalve Larvae Using Response	Predicting Cavitation in Sudden Enlargements,
New York,	Surface Techniques,	W75-11151 8B
W75-11009 5C	W75-11081 5C	CD + CD + CC
ROTORUA LAKES (NEW ZEALAND)	SALINITY CONTROL	SEA GRASS
A Contribution to the Biology of Nitella	Legal and Institutional Problems in the	Transplanting Sea Grass in Mississippi Sound,
Hookeri A. BR. in the Rotorua Lakes, New	Management of Salinity,	W75-11207 4A
Zealand. II. Organic Nutrients and Physical	W75-11047 5G	SEA URCHINS
Factors,		The Effects of Crude Oils and the Dispersant
W75-11235 5C	SALMON	Corexit 8666 on Sea Urchin Gametes and Emb-
W/3-11233	Effects of Some Components of Crude Oil on	ryos,
RUNOFF	Young Coho Salmon,	W75-11090 5C
Occurrence of 2, 4, 5-T and Picloram in Sur-	W75-11088 5C	W/3-11090
face Runoff Water in the Blacklands of Texas,		The Effects of Oil Dispersants on the Cell in
W75-10895 5B	SALMON CREEK (NY)	Fertilization and Development,
	Utilization of Stream-Borne Phosphorus by	W75-11091 5C
Approximate Annual Water Budgets of Two	Cayuga Lake Phytoplankton,	
Chained Pinyon-Juniper Sites,	W75-11036 5C	SEA WATER
W75-10896 4A	CATHONING	Physiochemical Treatment of Wastewater-Sea-
	SALMONIDS	water Mixture by Electrolysis,
RUNOFF FORECASTING	Effect of DDT and M.S. 222 on Learning a	W75-10979 5D
Flood Runoff from Urban Areas,	Simple Conditioned Response in Rainbow	
W75-10904 5B	Trout (Salmo gairdneri),	Electrolytic Sea Water Process,
	W75-11025 5C	W75-11068 3A
RURAL WATER DISTRICT	Effects of Some Components of Crude Oil on	
Improved Design and Operating Criteria for	Young Coho Salmon.	SEABIRDS
Rural Water Districts,	W75-11088 5C	Oil Pollution and Seabirds in Denmark 1935-
W75-11056 6D	W 73-11086	1968,
	SALT TOLERANCE	W75-10893 · 5C
RUSTS	Salt and Specific Ion Effects on Germination of	CT AT A BUTC
Comparison of Uredo Eichhorniae, the Water-	Four Grasses,	SEALANTS
hyacinth Rust, and Uromyces Pontederiae,	W75-10894 2K	How to Make Squeeze Cementing Successful,
W75-11092 5G	***	W75-11286 8F
CLEE DRIVING WATER ACT	SAN JUAN MOUNTAINS (COL)	SEASONAL
SAFE DRINKING WATER ACT	An Elevational Control of Peak Snowpack	Seasonal Variation in Composition, Plant
The Responsibility of U.S. Water Suppliers,	Variability,	Biomass, and Net Primary Productivity of a
W75-10856 5G	W75-11155 . 2C	Tropical Grassland at Kurukshetra, India,
Frains the Beat Cost of Class Water		W75-11006 2I
Facing the Real Cost of Clean Water,	SAND PUMPING	W 75-11000 21
W75-10857 5G	Colorado City Solves Its Sand Pumping	Impact of Thermal Effluent from Steam-Elec-
The Impact of the Safe Drinking Water Act on	Problems,	tric Station on a Marshland Nursery Area dur-
Utilities,	W75-11261 8C	ing the Hot Season,
W75-10859 5G	SANDS	W75-11032 5C
	Cultivation of Netted Melon By Use of Trickle	
SAHELIAN ZONE	Irrigation in a Sand Field Plastic Greenhouse,	Seasonal Abundance of Crustacean Zooplank-
International Development Strategies for the	(In Japanese),	ton and Net Plankton Biomass of Lakes Huron,
Sahel.	W75-11095 3F	Erie, and Ontario,
W75-10861 4A	W15-11025	W75-11238 5C
	Studies on the Relationship Between Dry-	COCCUPANT OF COLUMN
SALINE WATER-FRESH WATER INTERFACES	Matter Production and the Development of a	SECONDARY PRODUCTIVITY
Approximation for Steady Interface Beneath a	Pine Forest on Coastal Sand Dunes (1), (In	The Influence of the Warm Cooling Water from
Well Pumping Fresh Water Overlying Salt	Japanese),	a Fossil Fueled Power Plant on Oceanographic
Water,	W75-11098 4A	Conditions and Composition of Plankton in
W75-11255 4B		Owase Bay I. Water Temperature in Relation to
CALIBLE WATER PROPERTY AND INCOME.	Colorado City Solves Its Sand Pumping	Distribution of Microplankton, (In Japanese),
SALINE WATER-FRESHWATER INTERFACES	Problems,	W75-11030 5C
Management of Retardation of Salt Water In-	W75-11261 8C	SEDIMENT CONCENTRATION
trusion in Coastal Aquifers,	SANTA EE COUNTY (N MEY)	Investigation of the Operating Characteristics
W75-11058 2F	SANTA FE COUNTY (N MEX) Estimated Availability of Surface and Ground	of the Iowa Sediment Concentration Measuring
SALINE WATER INTRUSION		System.
Management of Retardation of Salt Water In-	Water in the Pojoaque River Drainage Basin, Santa Fe County, New Mexico,	W75-11163 2J
trusion in Coastal Aquifers,	W75-10938 4A	23
W75-11058 2F	# 75-10936 4A	SEDIMENT DISTRIBUTION
21	Estimated Mean-Monthly and Annual Runoff	Investigation of the Operating Characteristics
Approximation for Steady Interface Beneath a	at Selected Sites in the Pojoaque River	of the Iowa Sediment Concentration Measuring
Well Pumping Fresh Water Overlying Salt	Drainage Basin, Santa Fe County, New Mex-	System,
Water,	ico,	W75-11163 2J
W75-11255 4B	W75-10943 2E	
		SEDIMENT SAMPLER
SALINITY	SATURATION	Investigation of the Operating Characteristics
A Note on Salinity and Temperature in Some	Condensation in Jets, Industrial Plumes and	of the Iowa Sediment Concentration Measuring
Moroccan Brackish Waters,	Cooling Tower Plumes,	System,
W75-10997 2L	W75-11166 2B	W75-11163 2J

SEDIMENT TRANSPORT

SEDIMENT TRANSPORT	SELF-PURIFICATION	SEWAGE POISONING
Stochastic Analysis of Particle Movement Over	Process Studies and Modeling of Self-Cleaning	A Waterborne Gastroenteritis Epidemic in Pico
a Dune Bed,	Capacity of Mountain Creeks for Recreation	Rivers, California,
W75-10942 2J	Planning and Management,	W75-11005 5F
	W75-11055 5B	
Mass-Emplaced Sand-Fingers at Mararoa Con-		SEWAGE TREATMENT
struction Site, Southern New Zealand,	SEMIARID CLIMATES	Pilot-Plant Study of Denitrification Using a
W75-11161 2J	Factors Affecting Erosion in a Semi-Arid	Submerged Sand Filter at Rye Meads Sewage
	Watershed,	Works,
Size-Sorting During Suspension Transporta-	W75-10884 2J	W75-10955 5D
tionLognormality and Other Characteristics,		First Stage of the World's Largest Pure Oxygen
W75-11162 2J	Revegetating Disturbed Areas in the Semiarid	Sewage Plant to Undergo Test.
	Southwest,	W75-10960 5D
SEDIMENT-WATER INTERFACES	W75-10892 4D	W 75-10900
Concurrent Nitrification-Denitrification at the		Some Studies on Nitrification in the Activated
Sediment-Water Interface as a Mechanism for	SEMINOLE COUNTY (FLA)	Sludge Process,
Nitrogen Losses from Lakes,	Recharge Areas of the Floridan Aquifer in	W75-10961 5D
W75-10902 5C	Seminole County and Vicinity, Florida,	
CERTAFRIE AND CERTICETIBES	W75-10944 7C	Wastewater Treatment Using Algae and Ar-
SEDIMENTARY STRUCTURES		temia,
Mass-Emplaced Sand-Fingers at Mararoa Con-	SENSITIVITY ANALYSIS	W75-10967 5D
struction Site, Southern New Zealand,	Study of Criteria and Models Establishing Op-	CI D.F. I. I. F
W75-11161 2J	timum Level of Hydrogeologic Information for	Slurry Deliquoring by Expression,
CEDIMENTATION	Groundwater Basin Management,	W75-10969 5D
SEDIMENTATION	W75-11042 2F	Innovative Process Treats Wastewater,
Matagorda Island, Texas: The Evolution of a	COD. D. WOLLD CO.	W75-10975 5D
Gulf Coast Barrier Complex,	SEPARATION TECHNIQUES	1175-10775
W75-11144 2L	Slurry Deliquoring by Expression,	Anaerobic Acidogenesis of Wastewater Sludge,
Denudation Studies: Can We Assume Stream	W75-10969 5D	W75-10976 5D
Steady State,		
W75-11154 2J	Lamella Sedimentation: A Compact Separation	\$3-Million and Two-and-a-Half Years to Solve
W 75-11154	Technique,	Campbell River's Sewage Problems,
Sediment Processes in Great Lakes.	W75-10989 5D	W75-10977 5D
W75-11237 2J	Oil Separator with Coolessing Media	ICUs Door Chaft 'Holios Chidas Volume'
11.12.11.20.1	Oil Separator with Coalescing Media,	ICI's Deep Shaft 'Halves Sludge Volume', W75-10981 5D
SEDIMENTOLOGY	W75-11071 5G	W75-10981 5D
Review of Conference on Hydrology of Deep	Extraction and Analytical Techniques for Pesti-	Water Pollution Problems in Salisbury, Rhode-
Sedimentary Basins,	cides in Soil, Sediment, and Water,	sia: Present and Future,
W75-10935 5B		W75-10983 5G
	W75-11236 5A	W 15-10705
Sediment Processes in Great Lakes,	SEPHOLOSPORIUM ZONATUM	Pump Selection,
W75-11237 2J	Utilization of Phytopathogens as Biocontrols	W75-11002 8C
	for Aquatic Weeds,	
SEDIMENTS	W75-11206 5G	YWA Plan for Cleaner Rivers,
Hydrogeology and Water Resources of Middle	1175-11200	W75-11017 5D
Kirkland Creek Basin, Yavapai County,	SEPTIC TANKS	Nitrogen Removal in the Operation of the
Arizona,	Wastewater Treatment Plant,	Mililani Sewage Treatment Plant,
W75-10872 4B	W75-11076 5D	W75-11041 5D
	11/3/11/07	W/3-11041 3D
Measurement of Cobble Abrasion in Natural	SETTLING BASINS	Process for Treating Sewage Sludge,
Streams,	Lamella Sedimentation: A Compact Separation	W75-11064 5D
W75-10881 2J	Technique,	
W 5 1 10 15 W 6	W75-10989 5D	Aerobic Lagoon Waste Treatment System and
Mass-Emplaced Sand-Fingers at Mararoa Con-	1175-10707	Method,
struction Site, Southern New Zealand,	SETTLING VELOCITY	W75-11069 5D
W75-11161 2J	In Situ Measurement of the Settling Velocity	W T
Sinc Sentine During Supremier Transports	Profile of Particulate Organic Carbon in Lake	Wastewater Treatment Plant,
Size-Sorting During Suspension Transporta-	Ontario,	W75-11076 5D
tionLognormality and Other Characteristics, W75-11162 2J	W75-11227 5C	Activated Carbon Adsorption Technique for
W75-11162 2J		Third Stage Sewage Water Treatment, (In
Extraction and Analytical Techniques for Pesti-	SEWAGE	Japanese),
cides in Soil, Sediment, and Water,	Stability of Nitrosamines in Samples of Lake	W75-11108 5D
W75-11236 5A	Water, Soil, and Sewage,	
W15-11230	W75-11019 5B	On-Site Hypochlorite Generation,
SEED TREATMENT		W75-11109 5D
Establishing Alkali Sacaton on Harsh Sites in	The Water Quality and Bottom Sediment	
the Southwest,	Characteristics of New Jersey Lagoon	A Solution to Pump Stoppages,
W75-10882 4A	Developments,	W75-11111 8C
40	W75-11104 5B	Investigations on the Lora Tarm Dischanical
SEEDS		Investigations on the Long Term Biochemical Oxidation of Sewage,
The Early Vegetative Growth of Two Annual	SEWAGE BACTERIA	W75-11116 5D
Pasture Grasses (Hordeum Leporinum Link	Drug Resistant Coliforms Call for Re-Evalua-	W/3-11110
and Lolium Rigidum Gaud.),	tion of Water Quality Standards,	Nitrogenous Changes During the Settlement of
W75-10876 . 3F	W75-11130 5B	Sewage,
		W75-11120 *5D
The Germination and Establishment of Two	SEWAGE LAGOONS	
Annual Pasture Grasses (Hordeum Leporinum	Aerobic Lagoon Waste Treatment System and	Aeration Devices: The Manufacturer's View-
Link and Lolium Rigidum Gaud.),	Method,	point,
W75-10897 2I	W75-11069 5D	W75-11121 5D

Simplified Waste Water Purification Through	Soils of the Decest Southwest	CIE ETSNACIST (MISNAT A MISNATURE)
Physical-Chemical Treatment (Vereinfachte	Soils of the Desert Southwest, W75-10878	SLUDGE TREATMENT
Abwasserreinigung durch physikalisch	W75-10878 2G	Settlement and Sludge Return in Activated-
chemische Behandlung),	SIEVE ANALYSIS	Sludge Type Package Plants, W75-10973
W75-11122 5D	Size-Sorting During Suspension Transporta-	W75-10973 5D
	tionLognormality and Other Characteristics,	Anaerobic Acidogenesis of Wastewater Sludge,
Water Quality Control in Sewage Water Treat- ment, (In Japanese),	W75-11162 2J	W75-10976 5D
W75-11133 5D	SILICA	Total Waste Recycle System for Water Purifi-
	How Silica Affects Iron Removal from	cation Plant Using Alum as Primary Coagulant,
SEWERAGE	Groundwater,	W75-11094 5D
A Planning of Catchment Sewerage for Oyodo	W75-11016 5F	
River (In Japanese), W75-11113 5D	CIMIT ATTON ANALYCIC	The Economy of Various Methods for De-
W75-11113 5D	SIMULATION ANALYSIS A Three-Dimensional Model for Estuaries and	watering Sludge From Biological Purification (Ueber die Wirtschaftlichkeit verschiedener
SEWERS	Coastal Seas: Vol. II, Aspects of Computation,	Verfahren zur Entwaesserung von
Design ConsiderationsWater and Effluent	W75-10900 2L	biologischem Klaerschlamm),
Disposal,		W75-11127 5D
W75-11128 5D	An Assessment of Snowpack Depletion-Sur-	
Design of the Optimal Outfall System for a	face Runoff Relationships on Forested	Bark as Trickling-Filter Dewatering Medium
Stream Receiving Thermal and Organic Waste	Watersheds,	for Pulp and Paper Mill Sludge,
Discharges,	W75-11049 4A	W75-11241 5D
W75-11137 5B	Limitations of Using a Simulation Model of the	Possibilities of Reutilization of Kaolin from
	Soil Under Irrigated Cultivation to Simulate the	Biological Waste Water Sludges
SHALE	Functioning of the Soil as a Purifying System	(Moeglichkeiten der Wiederverwertung von
How Downhole Temperatures, Pressures Af-	(Limites D'Utilisation D'Un Modele de Com-	Kaolin aus biologischen Abwasserchlaemmen),
fect Drilling; Part 7: The Shale Resistivity Ratio	portement du sol sous Culture Irriguee Pour	W75-11349 5D
 A Valuable Tool for Making Economic Drilling Decisions, 	Simuler le Fonctionnment du sol Comme	
W75-11297 8G	Systeme Epurateur),	SLURRIES
113-11027	W75-11125 5B	How to Make Squeeze Cementing Successful,
SHALE RESISTIVITY RATIO	Hudralasia Investigation and Design of Union	W75-11286 8F
How Downhole Temperatures, Pressures Af-	Hydrologic Investigation and Design of Urban Stormwater Drainage Systems,	SMALL WATERSHEDS
fect Drilling; Part 7: The Shale Resistivity Ratio	W75-11141 4A	Difficulties in Gauging Small Catchments - A
- A Valuable Tool for Making Economic	40	Case Study,
Drilling Decisions, W75-11297 8G	Simulation of Water Quality Management Poli-	W75-11306 2E
W75-11297 8G	cies,	
SHAWANGUNK MTS (NY)	W75-11181 5G	SNAILS
Geochemical Reconaissance of Surficial	Advanced Techniques in the Mathematical	Copper Toxicity in Busycon Canaliculatum L., W75-11031 5C
Materials in the Vicinity of Shawangunk Moun-	Modeling of Water-Distribution Systems,	W75-11031 5C
tain, New York,	W75-11183 4A	SNAKE RIVER WATERSHED (MINN)
W75-10928 5A		Water Resources of the Snake River
SHEEP	SLIDE GATES	Watershed, East-Central Minnesota,
Water Consumption and Water Turnover of	Cavitation Control by Aeration of High-	W75-10946 7C
Sheep Grazing Semiarid Pasture Communities	Velocity Jets,	SNAKES
in New South Wales,	W75-11152 8B	The Use of Snakes as a Pollution Indicator
W75-10888 3F	SLOPE STABILITY	Species,
SHIPOWNERS	Application of Electrical Analogy to Draw	W75-11089 5B
Economics of Great Lakes Shipping in an Ex-	Flow Nets for Sudden Drawdown Conditions in	
tended Season,	Earth Dams,	SNOW MANAGEMENT
W75-11248 6C	W75-11143 8B	Differential Release of Water from Arizona
	SLUDGE	Snowpacks,
SHIPS	Dewaters Sludge.	W75-10860 2C
Economics of Great Lakes Shipping in an Ex-	W75-10966 5D	Wind-Snow Relations at Marmot Creek, Al-
tended Season, W75-11248 6C		berta,
W75-11248 6C	SLUDGE DIGESTION	W75-11226 2C
SHORE PROTECTION	A Solution to Pump Stoppages,	
Stabilization and Reconstruction of Texas	W75-11111 8C	Hydrologic Relations on Undisturbed and Con- verted Big Sagebrush Lands: The Status of Our
Coastal Foredunes with Vegetation,	SLUDGE DISPOSAL	Knowledge,
W75-10887 2L	Some Observations on Behavior of the Treated	W75-11313 4D
Beach Erosion Control Structure,	Sewage Disposed in the Sea,	
W75-11075 8A	W75-11020 5B	SNOW SURVEYS
777 11075		An Elevational Control of Peak Snowpack
SHRUBS	Design ConsiderationsWater and Effluent	Variability,
Shrub Transplanting for Watershed Manage-	Disposal,	W75-11155 2C
ment and Range Improvement in Iran,	W75-11128 5D	SNOW-WIND RELATIONSHIPS
W75-10870 4D	Bark as Trickling-Filter Dewatering Medium	Wind-Snow Relations at Marmot Creek, Al-
SIEROZEMS	for Pulp and Paper Mill Sludge,	berta,
Barrenness of Desert Pavement in Yuma Coun-	W75-11241 5D	W75-11226 2C
ty, Arizona,		
W75-10868 2G	SLUDGE DRYING	SNOWFALL
Manager of County of Day Co. "	Bark as Trickling-Filter Dewatering Medium	Wind-Snow Relations at Marmot Creek, Al-
Management of Southwestern Desert Soils, W75-10877 2G	for Pulp and Paper Mill Sludge, W75-11241 5D	berta, W75-11226 2C
20	1112-112-11	20

SNOWMELT

SNOWMELT	SOIL CRUSTING	SOIL WATER
Differential Release of Water from Arizona Snowpacks,	Use of Amendments to Reduce Water Require- ments for Stand Establishment of Small-Seeded	Effect of Soil-Water Relations on the Root Porosity, Transpiration and Ion Uptake in Rice
W75-10860 2C	Crops,	W75-10916 3F
	W75-11045 3F	COLUMN TO MANUELLE MENTE
An Assessment of Snowpack Depletion-Sur-	SOIL DENSITY	SOIL WATER MOVEMENT Moisture and Energy Conditions in a Draining
face Runoff Relationships on Forested Watersheds,	Soil Morphology and Soil Physical Properties:	Soil Mass,
W75-11049 4A	II. Mechanical Impedance and Moisture Reten- tion and Movement,	W75-11054 20
SNOWMELT RUNOFF	W75-10885 2G	SOIL-WATER-PLANT RELATIONSHIPS
An Assessment of Snowpack Depletion-Sur-	SOIL ENVIRONMENT	Phenology of Selected Sonoran Desert Plants a
face Runoff Relationships on Forested	Stability of Nitrosamines in Samples of Lake	Punta Cirio, Sonora, Mexico. W75-10862
Watersheds, W75-11049 4A	Water, Soil, and Sewage,	1175-10002
W75-11049 4A	W75-11019 5B	Management of Southwestern Desert Soils,
SNOWPACKS	SOIL INVESTIGATIONS	W75-10877 20
An Elevational Control of Peak Snowpack	Soils of the Desert Southwest,	The Germination and Establishment of Two
Variability,	W75-10878 2G	Annual Pasture Grasses (Hordeum Leporinum
W75-11155 2C	CON MANAGEMENT	Link and Lolium Rigidum Gaud.),
SOCIAL IMPACT	SOIL MANAGEMENT Management of Southwestern Desert Soils,	W75-10897 2
Social Impacts of Water Resources Develop-	W75-10877 2G	SOILS
ments and Their Implication for Urban and		Soils of the Desert Southwest,
Rural Development: A Post Audit Analysis of	SOIL MECHANICAL IMPEDANCE	W75-10878 20
the Weber Basin Project in Utah, W75-10854 6B	Soil Morphology and Soil Physical Properties: II. Mechanical Impedance and Moisture Reten-	Soil Map of the World, 1:5,000,000, Volume
W75-10854 6B	tion and Movement,	IV. South America.
SOCIAL VALUES	W75-10885 2G	W75-11138 70
Social Impacts of Water Resources Develop-	CON MOTORIUM	
ments and Their Implication for Urban and	SOIL MOISTURE Establishing Alkali Sacaton on Harsh Sites in	Extraction and Analytical Techniques for Pesti
Rural Development: A Post Audit Analysis of	the Southwest.	cides in Soil, Sediment, and Water, W75-11236 5A
the Weber Basin Project in Utah, W75-10854 6B	W75-10882 4A	
W/3-10634	Venetation Soil and Climate on the Const	SOILS SURVEYS
SODA ASH	Vegetation, Soil, and Climate on the Green Mountains of Vermont,	Contour Map of the Bedrock Surface, New
Longer Life for Submersibles.	W75-11021 21	Britain Quadrangle, Connecticut, W75-10950 70
W75-11259 8G		1175-10930
SODIUM ARSENITE	The Effect of Irrigation on the Yield and Quali- ty of Maincrop Potatoes.	Map Showing Depth to Bedrock, Worthington
The Geochemical Cycle of Arsenic in Lake	W75-11106 3F	Quadrangle, Massachusetts,
Washington and its Relation to Other Elements,	1175-11100	W75-10951 70
W75-10922 5B	Available Water-Holding Capacities of Soils in	Map Showing Depth to Bedrock, Mount Car
SODIUM COMPOUNDS	Southern Idaho, W75-11140 2G	mel Quandrangle, Connecticut,
On-Site Hypochlorite Generation,	W 75-11140 2G	W75-10954 70
W75-11109 5D	SOIL PHYSICAL PROPERTIES	SOLAR RADIATION
alternation of a summer of	Management of Southwestern Desert Soils,	The Nature and Components of the Hydrologi
SODIUM NIFURSTYRENATE	W75-10877 2G	cal Cycle,
Studies on Toxicity of Sodium Nifurstyrenate	Soils of the Desert Southwest,	W75-10864 24
(NFS-NA) in Cultured Yellowtail (In Japanese),	W75-10878 2G	SOLID WASTES
W75-11034 5C	Soil Morphology and Soil Physical Properties:	Illinois Landfill Law May Effect Nearby
	II. Mechanical Impedance and Moisture Reten-	States.
SOIL	tion and Movement,	W75-11011 51
The Use of Soil as a Purifying System (L'Utilisation du sol Comme Systeme Epu-	W75-10885 2G	SORGHUM
rateur),	SOIL STABILIZATION	Effects of Antitranspirants on Yield of Grain
W75-11126 5D	Revegetating Disturbed Areas in the Semiarid	Sorghum Under Limited Irrigation,
CONT. AMENDAMENTO	Southwest,	W75-10858
SOIL AMENDMENTS Use of Amendments to Reduce Water Require-	W75-10892 4D	SOUTH AFRICA
ments for Stand Establishment of Small-Seeded	SOIL SURFACES	Aeration Devices: The Manufacturer's View
Crops,	Soils of the Desert Southwest,	point, W75-11121 51
W75-11045 3F	W75-10878 2G	W75-11121 51
SOIL ANALYSIS	SOIL SURVEYS	South African Eutrophication Problems: A Per
Barrenness of Desert Pavement in Yuma Coun-	Map Showing Depth to Bedrock, Greenfield	spective,
ty, Arizona,	Quadrangle, Massachusetts,	W75-11131 56
W75-10868 2G	W75-10952 7C	SOUTH AMERICA
CON CHEMICAL BRODERTIES	Map Showing Depth to Bedrock, Chester	Soil Map of the World, 1:5,000,000, Volum
SOIL CHEMICAL PROPERTIES Management of Southwestern Desert Soils,	Quadrangle, Massachusetts,	IV, South America.
W75-10877 2G	W75-10953 7C	W75-11138
20	SOIL TEXTURE	SOUTH CAROLINA
SOIL CLASSIFICATION	Barrenness of Desert Pavement in Yuma Coun-	Biological Control of Alligator Weed, 1959
Soils of the Desert Southwest,	ty, Arizona,	1972, W75 11202
W75-10878 2G	W75-10868 2G	W75-11202 50

SOUTH DAKOTA Watershed Management in the Black Hills: The	Practical 'Application of Surface Fixed-System for Multi-Purpose Sprinkler Irrigation Uses, (In	The Design of Storm Water Drainage Channels Using Mathematical Model Techniques,
Status of Our Knowledge,	Japanese),	W75-11150 8B
W75-11318 4D	W75-11097 3F	STORM WATER
SOUTHEAST US	SQUEEZE CEMENTING	Flood Runoff from Urban Areas,
Denudation Studies: Can We Assume Stream	How to Make Squeeze Cementing Successful,	W75-10904 5B
Steady State,	W75-11286 8F	
W75-11154 2J		STORMS
	STAGE-DISCHARGE RELATIONS	Analysis of Colorado Precipitation,
SOUTHWEST	Automated Distribution of Gauge and Shift	W75-11040 2B
Products from Jojoba: A Promising New Crop	Corrections, W75-10911 7C	STRATIFICATION
for Arid Lands.	W 75-10911	Hydraulic Modeling of Mixing Phenomena in
W75-10890 3F	STARCH	Stratified Lakes,
SOUTHWEST U.S.	Solute-Solute Interactions in Ultrafiltration	W75-11043 2H
Revegetating Disturbed Areas in the Semiarid	Treatment of Paper Mill Wastes,	
Southwest.	W75-11334 5D	STRATIFIED FLOW
W75-10892 4D	STATISTICAL METHODS	Hydraulic Modeling of Mixing Phenomena in
	Time-Variant Characteristics of Selected	Stratified Lakes, W75-11043 2H
Use of Amendments to Reduce Water Require-	Wastewater Treatment Plants of Nevada,	W75-11045 2f1
ments for Stand Establishment of Small-Seeded	W75-11245 5D	Some Results on Mass Transfer Processes in a
Crops,		Density-Stratified Flow,
W75-11045 3F	Detection of Change in Sequences of	W75-11057 8B
SOUTHWEST US	Hydrologic Data,	CORP. LA ER COLOR.
	W75-11302 7C	STREAM EROSION
Soils of the Desert Southwest, W75-10878 2G	STATISTICAL MODELS	Measurement of Cobble Abrasion in Natural
W75-10878 2G	Multilag Markov Models for Eastern Australian	Streams, W75-10881 2J
SPATIAL DISTRIBUTION	Streams,	W 73-10001 23
Biochrome Analysis as a Method for Assessing	W75-11301 2E	Factors Affecting Erosion in a Semi-Arid
Phytoplankton Dynamics, Phase II,		Watershed,
W75-11052 5C	STATISTICAL STUDIES	W75-10884 2J
	Covariance Analysis of Reservoir Development	OFFICE AL OFFI
How Downhole Temperatures, Pressures Af-	Effects on Property Tax Base,	STREAM GAGES Difficulties in Gauging Small Catchments - A
fect Drilling; Part 5: Predicting Hydrocarbon	W75-10851 6B	Case Study,
Environments with Wireline Data,	STATUTES	W75-11306 2E
W75-11295 8G	Information as a Regulatory Tool in Water	W/3-11300 ZE
How Downhole Temperatures, Pressures Af-	Quality Control,	STREAMFLOW
fect Drilling; Part 6: Correlating Geopressure	W75-10903 5G	Automated Hourly Computations,
Gradients with Hydrocarbon Accumulations,	Omes + 2.4	W75-10915 7C
W75-11296 8G	STEAM	
	How Steam is Produced and Handled at the	Predicting Recessions Through Convolution,
SPAWNING	Geyers, W75-11280 4B	W75-10917 2E
Effects of Ozone-Treated Seawater on the	W /3-11280 4B	Streamflow in the New York Part of the
Spawned, Fertilized, Meiotic, and Cleaving	STEAM-ELECTRIC PLANTS	Susquehanna River Basin,
Eggs of the Commercial American Oyster,	Impact of Thermal Effluent from Steam-Elec-	W75-10931 2E
W75-11256 5C	tric Station on a Marshland Nursery Area dur-	
SPECIES DIVERSITY	ing the Hot Season,	Estimated Availability of Surface and Ground
Species Diversity of Benthic Macroin-Ver-	W75-11032 5C	Water in the Pojoaque River Drainage Basin,
tebrates and Limnological Conditions in a 1st	STEELON-NET VEILS	Santa Fe County, New Mexico, W75-10938 4A
Order Mountain Stream,	Use of Steelon-Net Veils for Protection of the	W/3-10938 4A
W75-10918 21	Hydro-Engineering Works Against Dreissena	Low-Flow Characteristics of Selected Streams
	Polymorphia Pall,	in Northeastern Washington,
SPECIFIC CONDUCTIVITY	W75-11033 5G	W75-10939 2E
Specific Conductance Method for in Situ Esti-		Edward Ward Name of Assault Broad
mation of Total Dissolved Solids,	STOCHASTIC PROCESSES	Estimated Mean-Monthly and Annual Runoff at Selected Sites in the Pojoaque River
W75-11167 5A	Stochastic Analysis of Particle Movement Over	Drainage Basin, Santa Fe County, New Mex-
ODE CHARGE ATTICKED	a Dune Bed, W75-10942 2J	ico,
SPECIFICATIONS Criteria for Herbicide Evaluation,	W 73-10942	W75-10943 2E
	STORAGE	
W75-11196 5G	Flood Runoff from Urban Areas,	Multilag Markov Models for Eastern Australian
SPORES	W75-10904 5B	Streams,
Phytophthora Species in Arizona: Its Occur-	S Observations Conserving Proposition	W75-11301 2E
rence in Recycled Irrigation water,	Some Observations Concerning Preparation and Storage of Stream Samples for Dissolved	Australian Arid Zone Streangauging,
W75-10883 5A	Inorganic Phosphate Analysis,	W75-11307 2E
	W75-11336 5A	
SPORT FISHING		Variability, Persistence and Yield of Australian
Some Limnological Characteristics of Arivaca	STORM DRAINS	Streams,
Lake in Southern Arizona,	The Design of Storm Water Drainage Channels	W75-11308 2E
W75-10891 2H	Using Mathematical Model Techniques,	STREAMFLOW FORECASTING
SPRINKLER IRRIGATION	W75-11150 8B	Droughts, Distributions and Dependence: An
Sprinkler Irrigation Practice, (La Pratique De	STORM RUNOFF	Analysis of Some Synthetic Data Generation
L'Irrigation Par Aspersion),	YWA Plan for Cleaner Rivers,	Methods,
W75-10875 3F	W75-11017 5D	W75-11305 2E

STREAMS

STREAMS	SULFITE LIQUORS	SWEDEN
Temperatures of Kansas Streams,	Treating Effluents from a Sulphite Pulp Mill by	Underground Wastewater Treatment Plants,
W75-10933 2E	Flotation,	W75-10974 5D
	W75-11347 5D	
Utilization of Stream-Borne Phosphorus by		Water Conservation in Sweden: III. Current
Cayuga Lake Phytoplankton,	SULFURIC ACID	Trends,
W75-11036 5C	Use of Amendments to Reduce Water Require-	W75-10987 5G
	ments for Stand Establishment of Small-Seeded	
Denudation Studies: Can We Assume Stream	Crops,	SYCAMORE CREEK (ARIZONA)
Steady State,	W75-11045 3F	Factors Affecting Erosion in a Semi-Arid
W75-11154 2J		Watershed,
	SUMMER	W75-10884 2J
A Study of Factors Controlling the Chemical	Impact of Thermal Effluent from Steam-Elec-	
Quality of Water in Cartwright Creek Basin,	tric Station on a Marshland Nursery Area dur-	SYNTHETIC HYDROLOGY
Williamson County, Tennessee,	ing the Hot Season,	Generation of Arid Zone Rainfall and Runoff,
W75-11164 2K	W75-11032 5C	W75-11303 2A
Concentration and Genera of Algae in Selected	SUN-GLINT	Droughts, Distributions and Dependence: An
Illinois Streams, 1971-1973,	The Utilization of Sun-Glint in a Study of Lake	Analysis of Some Synthetic Data Generation
W75-11165 5A	Dynamics,	Methods,
	W75-11239 5A	W75-11305 2E
STREPTOMYCES-SCABIES		11.5 11.505
The Effect of Irrigation on the Yield and Quali-	SUPERSATURATION	SYSTEMATICS
ty of Maincrop Potatoes,	Dissolved Gas Supersaturation and Dilution in	The Role of Planktonic Protozoa in the Marine
W75-11106 3F	Thermal Plumes from Steam Electric Generat-	Food Chain. Seasonal Changes, Relative
W/3-11100	ing Stations,	
STRIP MINE LAKES	W75-11159 5B	Abundance, and Cell Size Distribution of Tin-
		tinnida,
Acid Strip Mine Lake Recovery, W75-11224 5C	SUPPLEMENTAL IRRIGATION	W75-11191 5C
W75-11224 5C	Scheduling and Application Rates of Irrigation	CUCTEME OBED ATIONAL ANALYSIS MODEL
SUBMERGED PLANTS	in a Humid Climate,	SYSTEMS OPERATIONAL ANALYSIS MODEL
	W75-11048 3F	Distribution-System Operation Analysis Model,
Chemical Control of Egeria Densa,		W75-11180 5D
W75-11199 5G	SURFACE TENSION	
T 1	Surface Tension Reductions and Urban Wastes	TAIWAN (TAIPEI BASIN)
Transplanting Sea Grass in Mississippi Sound,	in The New York Bight,	Ground Water Depletion and Subsidence
W75-11207 4A	W75-10927 5B	Problems in Taipei Basin,
CUMANDOUNT D DUMP		W75-11262 4B
SUBMERSIBLE PUMP	SURFACE WATERS	
Electrical Tests for Submersible Pumps,	Concentration and Genera of Algae in Selected	TAMARISK
W75-11260 8G	Illinois Streams, 1971-1973,	An Appraisal of Potential Water Salvage in the
	W75-11165 5A	Lake McMillen Delta Area, Eddy County, New
Will Submersibles Make Jet Pumps Obsolete.		Mexico,
W75-11263 8C	SURFACTANTS	W75-10941 3B
	Surface Tension Reductions and Urban Wastes	
SUBMERSIBLES	in The New York Bight,	TAX RATES
Installing Submersibles.	W75-10927 5B	Covariance Analysis of Reservoir Development
W75-11264 8C		Effects on Property Tax Base,
	Tensids (Syndets) and the Water Pollution	W75-10851 6R
SUBSURFACE MAPPING	Problem, (Gesund-Heitliche Aspekte Des Ten-	
Computer Algorithms Useful for Determining a	sid-Gebrauchs),	TECHNOLOGY
Subsurface Electrical Profile Via High	W75-11134 5D	Computer Systems and Water Resources,
Frequency Probing,	CEIDAIDAIG	W75-11174 6A
W75-10910 8G	SURVEYS	
	Geochemical Reconaissance of Surficial	TEMPERATURE
SUBSURFACE RUNOFF	Materials in the Vicinity of Shawangunk Moun-	Temperature Effects on Microbial Growth in
Subsurface Flow from Snowmelt Traced by	tain, New York,	CSTR's,
Tritium,	W75-10928 5A	W75-10968 5D
W75-10921 2F	Y I I I W B	
	Land and Water Resources Survey in the Jebel	Relations Between Algal Populations and the
Moisture and Energy Conditions in a Draining	Marra Area, The Sudan.	pH of Their Media,
Soil Mass,	W75-11139 4A	W75-11028 5C
W75-11054 2G	SUSPENDED SOLIDS	
	Device for Automatic Determination of	Water Resource Observatory Climatological
SUDAN		Data, Water Year 1973.
Land and Water Resources Survey in the Jebel	Suspended Solids Content in Water,	W75-11035 7C
Marra Area, The Sudan.	W75-11063 5A	
W75-11139 4A	Investigation of the Operating Characteristics	A Reevaluation of the Combined Effects of
	of the Iowa Sediment Concentration Measuring	Temperature and Salinity on Survival and
SUDDEN DRAWDOWN	System.	Growth of Bivalve Larvae Using Response
Application of Electrical Analogy to Draw	W75-11163 2J	Surface Techniques,
Flow Nets for Sudden Drawdown Conditions in	11.5-11105	W75-11081 5C
Earth Dams,	SUSQUEHANNA RIVER BASIN (NY)	
W75-11143 8B	Streamflow in the New York Part of the	A Comparison of Effects of Elevated Tempera-
	Susquehanna River Basin,	ture Versus Temperature Fluctuations on Reef
SULFATES .	W75-10931 2E	Corals at Kahe Point, Oahu,
Interference of Sulfate Ion on SPADNS	173-10331	W75-11084 5C
(Sodium 2-(Sulfophenylazo)-1,8-Dihydrox-	SWAMPS	
ynaphthalene-3,6-Disulfonate) Colorimetric	Seasonal Abundance and Diversity of Benthos	Note on the Measurement of the Response of
Determination of Fluorine in Waste Waters,	in a Southern Illinois, USA Swamp.	Oceanographic Temperature Sensors,
W75-11343 5A	W75-11312 2H	W75-11146 7B
JA.	211	

How Downhole Temperatures, Pressures Af- fect Drilling; Part 4: Pitfalls in Overpressure Prediction,	TEXTILE INDUSTRY WASTES Upgrading Textile Operations to Reduce Pollution (Part 1) In Plant Control of Pollution	THERMAL PROPERTIES Note on the Measurement of the Response of
W75-11294 8G	tion. (Part 1). In-Plant Control of Pollution. W75-11326 5D	Oceanographic Temperature Sensors, W75-11146 7B
How Downhole Temperatures, Pressures Af-		THERMAL STRATIFICATION
fect Drilling; Part 5: Predicting Hydrocarbon Environments with Wireline Data,	Upgrading Textile Operations to Reduce Pollu- tion. (Part 2). Wastewater Treatment Systems. W75-11327	Two-Dimensional, Hydrostatic Simulation of Thermally-Influenced Hydrodynamic Flows,
W75-11295 8G	W75-11327 5D	W75-10901 2H
How Downhole Townsentures Browner Af	TEXTILES	THERMAL STRESS
How Downhole Temperatures, Pressures Af- fect Drilling; Part 6: Correlating Geopressure Gradients with Hydrocarbon Accumulations,	Upgrading Textile Operations to Reduce Pollu- tion. (Part 1). In-Plant Control of Pollution.	Adaptation of Copepod Populations to Thermal Stress.
W75-11296 8G	W75-11326 5D	W75-11046 . 5C
TEMPERATURE TOLERANCE	Upgrading Textile Operations to Reduce Pollu-	THERMOMETERS
Adaptation of Copepod Populations to Thermal Stress.	tion. (Part 2). Wastewater Treatment Systems. W75-11327 5D	Note on the Measurement of the Response of Oceanographic Temperature Sensors,
W75-11046 5C	THERMAL POLLUTION	W75-11146 7B
	Two-Dimensional, Hydrostatic Simulation of	THIXOTROPIC CEMENT
TEMPORAL DISTRIBUTION Biochrome Analysis as a Method for Assessing	Thermally-Influenced Hydrodynamic Flows,	Cementing Today's Problem Wells.
Phytoplankton Dynamics, Phase II,	W75-10901 2H	W75-11293 8F
W75-11052 5C	Thermal Response of Heated Streams, Solution	THREE-DIMENSIONAL FLOW MODEL
Time-Variant Characteristics of Selected	by the Implicit Method,	A Three-Dimensional Model for Estuaries and
Wastewater Treatment Plants of Nevada,	W75-10909 5B	Coastal Seas: Vol. II, Aspects of Computation, W75-10900 2L
W75-11245 5D	The Influence of the Warm Cooling Water from	W 75-10900 2L
TENNESSEE	a Fossil Fueled Power Plant on Oceanographic	THRUST FAULT (GEOLOGY)
A Study of Factors Controlling the Chemical	Conditions and Composition of Plankton in	Theory of Plasticity of Porous Media with Fluid Flow.
Quality of Water in Cartwright Creek Basin,	Owase Bay I. Water Temperature in Relation to	W75-11276 8E
Williamson County, Tennessee, W75-11164 2K	Distribution of Microplankton, (In Japanese), W75-11030 5C	
		TIDES Automated Tidal Computations,
TENNESSEE VALLEY AUTHORITY	Impact of Thermal Effluent from Steam-Elec-	W75-10912 7C
Dissipation of Residues of Phenoxy Herbicides Applied for Water Milfoil Control in Large	tric Station on a Marshland Nursery Area dur- ing the Hot Season,	
Reservoirs,	W75-11032 5C	TILAPIA-NILOTICA Quantitative Estimation of the Daily Ingestion
W75-11198 5B	Adaptation of Copepod Populations to Thermal	of Phytoplankton by Tilapia Nilotica and
TERTIARY TREATMENT	Stress,	Haplochromis Nigripinnis in Lake George, Uganda,
Advanced Wastewater Treatment (In	W75-11046 5C	W75-11268 2H
Japanese), W75-11114 5D	A Comparison of Effects of Elevated Tempera-	
W.5-11114	ture Versus Temperature Fluctuations on Reef	TIME LAG Derivation of Surface Water Lag Time for Con-
TESTING	Corals at Kahe Point, Oahu,	verging Overland Flow,
Simple Field Checks Will Provide Accurate DST Data,	W75-11084 5C	W75-11156 2E
W75-11281 8G	Dissolved Gas Supersaturation and Dilution in	TIME SERIES ANALYSIS
C 1 C . T . W . W	Thermal Plumes from Steam Electric Generat-	Turbulent Structure Near Smooth Boundary,
Casing-Seat Testing - Why and How, W75-11291 8F	ing Stations, W75-11159 5B	W75-11148 8B
		Detection of Change in Sequences of
TESTING PROCEDURES	Investigation of the Influence of Thermal	Hydrologic Data,
Electrical Tests for Submersible Pumps, W75-11260 8G	Discharge from a Large Electric Power Station	W75-11302 7C
	on the Temperature and Near-Shore Circula- tion of Lake Michigan,	TINTINNIDA
How to Conduct Corrosion Tests,	W75-11190 5C	The Role of Planktonic Protozoa in the Marine
W75-11292 8G	The Growth of Some Enishutic Alone is a Lake	Food Chain. Seasonal Changes, Relative Abundance, and Cell Size Distribution of Tin-
Determination of Chemical Oxygen Demand,	The Growth of Some Epiphytic Algae in a Lake Receiving Thermal Effluent,	tinnida,
COD(Cr), in Waste Waters of Pulp and Paper	W75-11225 5C	W75-11191 5C
Mills (Bestimmung des chemischen Sauerstoff- bedarfes, CSB(Cr), in Restabwaessern von	THERMAL BOWERDS ANTO	TISSUE ANALYSIS
Zellstoff und Papierfabriken).	THERMAL POWERPLANTS The Influence of the Warm Cooling Water from	Mercury Contents in Biologically Preserved
W75-11337 5A	a Fossil Fueled Power Plant on Oceanographic	Specimens of Menuke (Sebastes Baramenuke and S. Flammeus).
TEXAS	Conditions and Composition of Plankton in	and S. Flammeus), W75-11078 5A
Matagorda Island, Texas: The Evolution of a	Owase Bay I. Water Temperature in Relation to	
Gulf Coast Barrier Complex, W75-11144 2L	Distribution of Microplankton, (In Japanese), W75-11030 5C	Uptake of Cadmium, Zinc, Copper, Lead and Chromium in the Pacific Oyster, Crassostrea
	Impact of Thermal Effluent from Steam-Elec-	Gigas, Grown in the Tamar River, Tasmania,
Aquatic Plant Control on Lake Corpus Christi, W75-11194 5G	tric Station on a Marshland Nursery Area dur-	W75-11086 5B
	ing the Hot Season,	Studies on the Inorganic Components of
Integrated Controls on Noxious Aquatic Plants,	W75-11032 5C	Marine Animals-III, on the Contents of Cadmi-
W75-11204 5G	How Steam is Produced and Handled at the	um, Zinc, Copper, Lead and Iron in Muscle and Viscera of Marine Animals Captured in the
How to Seal Tubing Collar Leaks.	Geyers,	West Sea Area of Kyushu, (In Japanese),
W75-11287 8C	W75-11280 4B	W75-11087 5C

C of

SUBJECT INDEX

TOTAL ORGANIC CARBON

TOTAL ORGANIC CARBON	TRACE ELEMENTS	Huntingdon Research Centre Pasveer Oxida-
Effluent Characteristics and Treatment of	Heavy Metals and Other Trace Elements,	tion PlantSix Years On,
Mechanical Pulping Effluents,	W75-10934 5B	W75-11115 5D
	W 13-10934 3B	W 75-11115
W75-11331 5D	Debaujor of Mn Es Cu 7n Cd and Dh	Con a Computer Boolly Occasion Water Filter
	Behavior of Mn, Fe, Cu, Zn, Cd and Pb	Can a Computer Really Operate a Water-Filtra-
TOXAPHENE	Discharged from a Wastewater Treatment Plant	tion Plant,
Toxaphene Effects on Growth and Bone Com-	into an Estuarine Environment,	W75-11184 5F
position of Fathead Minnows, Pimephales	W75-11160 5B	
Promelas,		Time-Variant Characteristics of Selected
	TRACERS	Wastewater Treatment Plants of Nevada,
W75-11026 5C	Subsurface Flow from Snowmelt Traced by	
		W75-11245 5D
TOXICITY	Tritium,	w . w . c . c . p . p
Effect of DDT and M.S. 222 on Learning a	W75-10921 2F	Waste Water Survey, St. Regis Paper Com-
Simple Conditioned Response in Rainbow		pany, Cantonment, Florida.
Trout (Salmo gairdneri),	TRACES	W75-11314 5D
	Copper Toxicity in Busycon Canaliculatum L.,	
W75-11025 5C	W75-11031 5C	Considerations for Preparation of Operation
	1173-11031	
Toxaphene Effects on Growth and Bone Com-	TRANSITION FLOW	and Maintenance Manuals,
position of Fathead Minnows, Pimephales		W75-11317 5D
Promelas,	Transition in Oscillatory Flow Over Rippled	
W75-11026 5C	Beds,	Pollution Abatement in a Brewing Facility.
11 13-11020	W75-11149 8B	W75-11323 SD
Posters Influencies Assats Tradicity Potissister		
Factors Influencing Acute Toxicity Estimates	TRANSITION ZONES OF PRESSURE	Upgrading Poultry-Processing Facilities to
of Hydrogen Sulfide to Freshwater Inver-	How to Find Transition Zones in Soft Forma-	Reduce Pollution. (Part 3). Waste Treatment.
tebrates,		
W75-11027 5C	tions,	W75-11330 5D
	W75-11285 8G	
Copper Toxicity in Busycon Canaliculatum L.,		Workshop on Computer-Aided Design and
	TRANSPIRATION	Simulation of Waste Treatment Systems.
W75-11031 . 5C	Effect of Soil-Water Relations on the Root	W75-11338 5D
	Porosity, Transpiration and Ion Uptake in Rice,	W 7.5-113.56
Studies on Toxicity of Sodium Nifurstyrenate	The state of the s	THEFT
(NFS-NA) in Cultured Yellowtail (In	W75-10916 3F	TREES
Japanese),		Studies on the Relationship Between Dry-
	TRANSPLANTATION	Matter Production and the Development of a
W75-11034 5C	Transplanting Sea Grass in Mississippi Sound,	Pine Forest on Coastal Sand Dunes (1), (In
	W75-11207 4A	Japanese),
Continuous Automatic Monitoring of Surface		
Water with Fish,	TRANSPORTATION	W75-11098 4A
W75-11079 5A	Operations Platforms,	
		TRICKLE IRRIGATION
Standard Curves for Nuvacron, Malathion,	W75-11210 4A	Cultivation of Netted Melon By Use of Trickle
		Irrigation in a Sand Field Plastic Greenhouse,
Sevin, DDT, and Kelthane Tested Against the	Economics of Great Lakes Shipping in an Ex-	(In Japanese),
Mosquito Culex Pipiens L. and the	tended Season,	
Microcrustacean Daphnia Magna Straus,	W75-11248 6C	W75-11095 3F
W75-11082 5B		
	TREATMENT FACILITIES	Nozzle Hydraulics in the Trickle Irrigation
Effects of Some Components of Crude Oil on	Ozone Treatment Licks Color Problem.	SystemRelation Between Water Temperature
		and Nozzle Flow Rate (In Japanese),
Young Coho Salmon,	W75-10959 5D	W75-11096 3F
W75-11088 5C		W 73-11090
	Settlement and Sludge Return in Activated-	WOLCHE INC HIS WEDG
The Effects of Crude Oils and the Dispersant	Sludge Type Package Plants,	TRICKLING FILTERS
Corexit 8666 on Sea Urchin Gametes and Emb-	W75-10973 5D	Bark as Trickling-Filter Dewatering Medium
	11.0.10.10	for Pulp and Paper Mill Sludge,
ryos, 3/75 11000	Underground Wastewater Treatment Plants,	W75-11241 5E
W75-11090 5C		
	W75-10974 5D	TRITIUM
Some Effects of Copper on the Polychaete		
Phyllodoce Maculata,	\$3-Million and Two-and-a-Half Years to Solve	Subsurface Flow from Snowmelt Traced by
· W75-11136 5C	Campbell River's Sewage Problems,	Tritium,
	W75-10977 5D	W75-10921 2F
Interactions of Heavy Metals in the Activated		
	Membrane Desalting Gets Big Push,	TROPICAL GRASSLANDS
Sludge Process,	W75-10982 3A	Seasonal Variation in Composition, Plan
W75-11173 5D	JA	
	Industry and Community in Cooperation,	Biomass, and Net Primary Productivity of
Registration of Herbicides for Aquatic Use,		Tropical Grassland at Kurukshetra, India,
W75-11197 5G	W75-10985 5D	W75-11006 2
Herbicide Chemicals and Their Effect on the	Virus Removal and Inactivation During Water	TUBES
	Treatment,	Special Annulus Fluid Eases Casing Recovery.
Aquatic Environment,	W75-10991 5D	
W75-11211 5C		W75-11282 80
	Activated Carbon in the Water Treatment	TURBLE COLL IN
Acute Toxicity of Petrochemical Drilling Fluids	Plant,	TUBING COLLAR
Components and Wastes to Fish,		How to Seal Tubing Collar Leaks.
W75-11265 5C	W75-10992 5D	W75-11287 80
30	Wit Con Mark Con District	
The Toxicity of Drilling Fluid Components to	High Costs Modify Sewage Plant Expansion.	TUNDRA
	W75-10993 5D	
Aquatic Biological Systems, A Literature		How BP Alaska Cements Through Permafrost.
Review,	How to Estimate and Escalate Costs of Waste-	W75-11278 81
W75-11266 5C	water Equipment.	
	W75-11014 5D	TURBIDITY
Effluent Characteristics and Treatment of		Optimum Values for Operational Variables is
Mechanical Pulping Effluents,	Wastewater Treatment Plant,	Turbidity Removal,
W75-11331 5D	W75-11076 5D	W75-11110 SI
30		

TURBIDITY REMOVAL	URBAN HYDROLOGY	VARIABILITY
Optimum Values for Operational Variables in	Flood Runoff from Urban Areas,	An Elevational Control of Peak Snowpack
Turbidity Removal,	W75-10904 5B	Variability,
W75-11110 5D	W 12-10204	W75-11155 2C
W13-11110	Hydrologic Investigation and Design of Urban	W 75-11133
TURBULENCE	Stormwater Drainage Systems,	Variability, Persistence and Yield of Australian
Turbulent Structure Near Smooth Boundary,	W75-11141 4A	Streams,
W75-11148 8B		W75-11308 2E
	The Design of Storm Water Drainage Channels	
TURBULENT BOUNDARY LAYERS	Using Mathematical Model Techniques,	VARIETIES
Effect of Pressure Gradient on Wind-Waves in	W75-11150 8B	The Aquatic Weed Problem. 1. Identification,
a Laboratory Channel,		W75-11220 21
W75-11093 8B	URBAN LANDSCAPES	VECETATION
WINDS THE PLANE	Water Application Practices and Landscape At-	VEGETATION
TURBULENT FLOW	tributes Associated with Residential Water	Vegetation, Soil, and Climate on the Green Mountains of Vermont.
Some Results on Mass Transfer Processes in a	Consumption,	W75-11021 21
Density-Stratified Flow,	W75-11059 3D	W /3-11021
W75-11057 8B		Dissipation of Residues of Phenoxy Herbicides
Transition in Oscillatory Flow Over Rippled	URBAN SOCIOLOGY	Applied to the Watershed,
Beds.	Social Impacts of Water Resources Develop-	W75-11213 5B
W75-11149 8B	ments and Their Implication for Urban and	
mistries on	Rural Development: A Post Audit Analysis of	VEGETATION EFFECTS
TURBULENT STRUCTURE	the Weber Basin Project in Utah,	Effects of Pinyon-Juniper Removal on Natural
Turbulent Structure Near Smooth Boundary,	W75-10854 6B	Resource Products and Uses in Arizona,
W75-11148 8B		W75-10886 3E
	URBAN WASTES	
TURGOR	Surface Tension Reductions and Urban Wastes	Stabilization and Reconstruction of Texas
The Role of Endogenous Abscisic Acid in the	in The New York Bight,	Coastal Foredunes with Vegetation,
Response of Plants to Stress,	W75-10927 5B	W75-10887 21
W75-11319 3F	TIPED A DI SEI A PERINDI CRICOTREDA CO	Approximate Annual Water Budgets of Ture
	URBAN WATER SYSTEMS	Approximate Annual Water Budgets of Two
UGANDA (LAKE GEORGE)	An Implicit Approach to Pricing Agricultural	Chained Pinyon-Juniper Sites, W75-10896 4A
Quantitative Estimation of the Daily Ingestion	Water Transfers to Urban Uses,	W 73-10620
of Phytoplankton by Tilapia Nilotica and	W75-11178 4A	Environmental Impact Evaluation in Fresh
Haplochromis Nigripinnis in Lake George,	BURNES A DE BREA TRUMB BUGGET	water Impoundments by Vegetation Analysis of
Uganda,	URBAN WATER USE	the Terrestrial Ecosystem,
W75-11268 2H	An Implicit Approach to Pricing Agricultural	W75-10905 2
	Water Transfers to Urban Uses,	
UNDERGROUND TREATMENT PLANTS	W75-11178 4A	VEGETATION ESTABLISHMENT
Underground Wastewater Treatment Plants,	URBANIZATION	Establishing Alkali Sacaton on Harsh Sites in
W75-10974 5D	Balancing the Effects of Man's Actions on the	the Southwest,
UNDERSEAS WATER STORAGE		W75-10882 4A
	Hydrological Cycle, W75-10865 2A	
Could The Sea be Used to Store Water for	W75-10865 2A	Stabilization and Reconstruction of Texas
SupplyA Possible Scheme, W75-11129 4A	URINE	Coastal Foredunes with Vegetation,
W/3-11129 4A	Vacuum Distillation/Vapor Filtration Water	W75-10887 21
UNISEX FISH	Recovery,	Revegetating Disturbed Areas in the Semiario
Unisex Studies on the White Amur,	W75-11315 5D	Southwest,
W75-11205 5C		W75-10892 4I
77.0	USSR	
UNITED STATES	Translations on Environmental Quality, No. 33.	VERDIGRIS RIVER BASIN (OKLA)
Heavy Metals and Other Trace Elements,	W75-11246 5G	A Mathematical Model for Optimal Waste
W75-10934 5B		Load Allocations,
	UTAH	W75-11102 50
Freshwater Ecosystem Research in Water	Social Impacts of Water Resources Develop-	
Quality Management,	ments and Their Implication for Urban and	VERMONT
W75-11012 6G	Rural Development: A Post Audit Analysis of	Vegetation, Soil, and Climate on the Green
Water Pollution from Nonpoint Sources,	the Weber Basin Project in Utah,	Mountains of Vermont,
W75-11158 5B	W75-10854 6B	W75-11021 2
H15-11150 3B		VIRAL REMOVAL
UNSTEADY FLOW	Approximate Annual Water Budgets of Two	Virus Removal and Inactivation During Wate
Implicit Numerical Modeling of Unsteady	Chained Pinyon-Juniper Sites,	Treatment,
Flows,	W75-10896 4A	W75-10991 5I
W75-10925 8B	Process Studies and Madeline of Salf Clausian	
	Process Studies and Modeling of Self-Cleaning	VIRGINIA
URANIUM	Capacity of Mountain Creeks for Recreation	Aquatic Plant Control Using Herbicides in
Uranium Mineralization by Ground Water in	Planning and Management, W75-11055 5B	Large Potable Water Supply,
Sedimentary Rocks, Japan.	W75-11055 5B	W75-11201 50
W75-11145 2F	UTILITIES	VIDIORE
UDBAN DDATNACE	The Impact of the Safe Drinking Water Act on	VIRUSES
URBAN DRAINAGE	Utilities,	Virus Removal and Inactivation During Water
Hydrologic Investigation and Design of Urban	W75-10859 5G	Treatment,
Stormwater Drainage Systems,	30	W75-10991 51
W75-11141 4A	VACUUM SYSTEMS	VISCOSITY
The Design of Storm Water Drainage Channels	Vacuum Distillation/Vapor Filtration Water	Theory of Plasticity of Porous Media wit
Using Mathematical Model Techniques,	Recovery,	Fluid Flow,
W75-11150 8B	W75-11315 5D	W75-11276 81
0.0		

at a

G

C

F

D

SUBJECT INDEX

VOLUMETRIC ANALYSIS

VOLUMETRIC ANALYSIS	The Use of Soil as a Purifying System	Wastewater Treatment Using Algae and Ar-
Chelation Study of Copper (II): Fulvic Acid	(L'Utilisation du sol Comme Systeme Epu-	temia,
System,	rateur),	W75-10967 5D
W75-11219 5B Modification of the Iodimetric Titration	W75-11126 5D	Temperature Effects on Microbial Growth in CSTR's,
Method for the Determination of Bromide and	Evaluation of the Adsorptive Properties of Fly	W75-10968 5D
Its Application to Mixed Domestic-Industrial	Ash with Reference to a Pulp and Paper Mill Waste Effluent.	
Waste Effluents,	W75-11335 5D	Slurry Deliquoring by Expression,
W75-11341 5A		W75-10969 5D
NI A V VIG	Possibilities of Reutilization of Kaolin from	Chlorine-Containing Organic Constituents in
WALES The Water Industry in Transition,	Biological Waste Water Sludges	Chlorinated Effluents,
W75-11252 3E	(Moeglichkeiten der Wiederverwertung von	W75-10970 5D
	Kaolin aus biologischen Abwasserchlaemmen), W75-11349 5D	
WALKER'S DAM IMPOUNDMENT (VA)	W/3-11349	Aeration Devices: Basic Theory, W75-10971 5D
Aquatic Plant Control Using Herbicides in a	WASTE WATER DISPOSAL	W/5-109/1
Large Potable Water Supply, W75-11201 5G	Use of Productivity of Periphyton to Estimate	Adjudicating Tenders for Aeration Devices:
W/3-11201	Water Quality,	Best Value and Reliability,
WARM AIR	W75-10936 5B	W75-10972 5D
The Role of Endogenous Abscisic Acid in the	WASTE WATER (POLLUTION)	Settlement and Sludge Return in Activated-
Response of Plants to Stress, W75-11319 3F	Upgrading Poultry-Processing Facilities to	Sludge Type Package Plants,
W/3-11319 3F	Reduce Pollution. (Part 1). In-Process Pollution	W75-10973 5D
WARM-WATER FISH	Abatement,	TI I I III I III I I I I I I I I I I I
Limnology of Desert Ponds,	W75-11328 5D	Underground Wastewater Treatment Plants, W75-10974 5D
W75-10880 2H	M. P. C. C. A. T. Harris Transfer	W/3-109/4
WASHINGTON	Modification of the Iodimetric Titration Method for the Determination of Bromide and	Innovative Process Treats Wastewater,
The Geochemical Cycle of Arsenic in Lake	Its Application to Mixed Domestic-Industrial	W75-10975 5D
Washington and its Relation to Other Elements,	Waste Effluents.	Anaerobic Acidogenesis of Wastewater Sludge,
W75-10922 5B	W75-11341 5A	W75-10976 5D
Use of Productivity of Periphyton to Estimate		
Water Quality,	Interference of Sulfate Ion on SPADNS	\$3-Million and Two-and-a-Half Years to Solve
W75-10936 5B	(Sodium 2-(Sulfophenylazo)-1,8-Dihydrox-	Campbell River's Sewage Problems, W75-10977 5D
	ynaphthalene-3,6-Disulfonate) Colorimetric Determination of Fluorine in Waste Waters,	W75-10977 5D
Low-Flow Characteristics of Selected Streams	W75-11343 5A	Algae Removal Using Dissolved Air Flotation,
in Northeastern Washington, W75-10939 2E		W75-10978 5D
W 15-10757	WASTE WATER TREATMENT	Physiochemical Treatment of Wastewater-Sea-
Ammonia Excretion by Zooplankton and its	Pilot-Plant Study of Denitrification Using a	water Mixture by Electrolysis,
Significance to Primary Productivity During	Submerged Sand Filter at Rye Meads Sewage	W75-10979 5D
Summer, W75-11187 5C	Works, W75-10955 5D	5 . W 5 6 5
W/3-1116/	W13-10933	Desirable Provision in Current Designs for Fu-
WASTE DISPOSAL	Water and Wastewater Disinfection with	ture Development in Relation to Reclamation of Effluent,
Water Conservation in Sweden: III. Current	Ozone: A Critical Review,	W75-10980 5D
Trends, W75-10987 5G	W75-10956 5D	
W/3-1098/	Population Dynamics of Protozoa in Waste-	ICI's Deep Shaft 'Halves Sludge Volume',
Illinois Landfill Law May Effect Nearby	water,	W75-10981 5D
States.	W75-10957 5D	Membrane Desalting Gets Big Push,
W75-11011 5B	m	W75-10982 3A
Mobile Unit for Treating Liquid Waste,	The Mechanism of Flocculation Processes in	Water Pollution Problems in Salisbury, Rhode-
W75-11073 5D	the Presence of Humic Stubtances, W75-10958 5D	sia: Present and Future,
The Water Coulity and Battom Sodiment	W 15-10750	W75-10983 5G
The Water Quality and Bottom Sediment Characteristics of New Jersey Lagoon	Ozone Treatment Licks Color Problem.	N
Developments,	W75-10959 5D	Nitrogen Removal in a Pilot Plant, W75-10984 5D
W75-11104 5B	First Stage of the World's Largest Pure Oxygen	W 73-10984 3D
	Sewage Plant to Undergo Test.	Industry and Community in Cooperation,
WASTE HEAT Status of Waste Heat Utilization and Dual-Pur-	W75-10960 5D	W75-10985 5D
pose Plant Projects.		Wastewater Treatment Plant Odors: A Continu-
W75-11251 3E	Some Studies on Nitrification in the Activated	ing Enigma,
	Sludge Process, W75-10961 5D	W75-10986 5D
WASTE LOAD ALLOCATIONS A Mathematical Model for Optimal Waste	W 73-10961 3D	W C
Load Allocations,	Preserving Activated Sludge,	Water Conservation in Sweden: III. Current Trends.
W75-11102 5G	W75-10962 5D	W75-10987 5G
	Disinfesting Westernam with Class	
WASTE RECYCLING	Disinfecting Wastewater with Chlorina- tion/Dechlorination Part 1,	Carbon Regeneration by Wet Air Oxidation,
Total Waste Recycle System for Water Purifi- cation Plant Using Alum as Primary Coagulant,	W75-10963 5D	W75-10988 5D
W75-11094 5D		Lamella Sedimentation: A Compact Separation
	Nitrogen Removal by Catalyst-Aided Break-	Technique,
WASTE TREATMENT	point Chlorination,	W75-10989 5D
Oxidation of Organic Compounds in Water (Oxidation organischer Verbindungen in	W75-10965 5D	Virus Removal and Inactivation During Water
(Oxidation organischer Verbindungen in Wasser),	Dewaters Sludge.	Treatment,
W75-11118 5D	W75-10966 5D	W75-10991 5D

5D ddge, 5D Solve 5D

5D
5D
5D
5D
5T
5D
5G
7,
5D
5D
Vater

5D

Activated Carbon in the Water Treatment	A Solution to Pump Stoppages,	Changes in Vegetation and Surface Soil Proper-
Plant,	W75-11111 8C	ties Following Irrigation of Woodlands with
W75-10992 5D	A Planning of Catchment Sewerage for Oyodo	Municipal Wastewater,
High Costs Modify Sewage Plant Expansion. W75-10993 5D	River (In Japanesė), W75-11113 5D	W75-11243 5B Time-Variant Characteristics of Selected
Minitest Method for Monitoring Effluent Quali-	Advanced Wastewater Treatment (In	Wastewater Treatment Plants of Nevada, W75-11245 5D
ty, W75-10994 5D	Japanese),	
	W75-11114 5D	Waste Water Survey, St. Regis Paper Com- pany, Cantonment, Florida.
Pump Selection, W75-11002 8C	Huntingdon Research Centre Pasveer Oxida- tion PlantSix Years On,	W75-11314 5D
Calcium Sulfate Solubility in Brackish Water Concentrates and Applications to Reverse Os-	W75-11115 5D	Vacuum Distillation/Vapor Filtration Water Recovery,
mosis Processes: Polyphosphate Additives,	Investigations on the Long Term Biochemical Oxidation of Sewage,	W75-11315 5D
W75-11004 5D	W75-11116 5D	Considerations for Preparation of Operation
How to Estimate and Escalate Costs of Waste- water Equipment,	Treatment Methods of Groundwater Containing	and Maintenance Manuals, W75-11317 5D
W75-11014 5D	a Large Quantity of Humic Acid (Aufbereitungsversuche an einem stark humin-	Upgrading Meat Packing Facilities to Reduce
How Silica Affects Iron Removal from Groundwater,	stoffbelasteten Tiefengrundwasser), W75-11117 5D	Pollution. (Part 1). In-Process Modifications and Pretreatment,
W75-11016 5F	Oxidation of Organic Compounds in Water	W75-11320 5D
YWA Plan for Cleaner Rivers, W75-11017 5D	(Oxidation organischer Verbindungen in Wasser).	Upgrading Meat Packing Facilities to Reduce Pollution. (Part 2). Waste Treatment,
Nitrogen Removal in the Operation of the	W75-11118 5D	W75-11321 5D
Mililani Sewage Treatment Plant,	Nitrogenous Changes During the Settlement of	Upgrading Meat Packing Facilities to Reduce
W75-11041 5D	Sewage, W75-11120 5D	Pollution. (Part 3). Choosing the Optimum Financial Strategy,
Process for Treating Sewage Sludge, W75-11064 5D	Aeration Devices: The Manufacturer's View-	W75-11322 5D
Process for Treating Industrial Wastes, W75-11066 5D	point, W75-11121 5D	Pollution Abatement in a Brewing Facility. W75-11323 5D
Process for Treating Industrial Wastes,	Simplified Waste Water Purification Through Physical-Chemical Treatment (Vereinfachte	Upgrading Metal-Finishing Facilities to Reduce Pollution. (Part 1). In-Process Pollution Abate-
W75-11067 5D	Abwasserreinigung durch physikalisch chemische Behandlung),	ment, W75-11324 5D
Aerobic Lagoon Waste Treatment System and Method,	W75-11122 5D	Upgrading Metal-Finishing Facilities to Reduce
W75-11069 5D	Chemical-Biological Treatment With Biological Filters,	Pollution. (Part 2). Waste Treatment, W75-11325 5D
Mobile Unit for Treating Liquid Waste, W75-11073 5D	W75-11123 5D	Upgrading Textile Operations to Reduce Pollu-
Wastewater Treatment Plant,	Aeration by Means of Blast NozzleA Possi- bility for the Aeration of Biological Waste	tion. (Part 1). In-Plant Control of Pollution.
W75-11076 5D	Water Treatment Plants (Die Strahlduesen-	W75-11326 5D
Flocculation Device for Waste Fluid Treat- ment,	begasungeine Moeglichkeit zur Belueftung biologischer Klaeranlagen),	Upgrading Textile Operations to Reduce Pollu- tion. (Part 2). Wastewater Treatment Systems.
W75-11077 5D	W75-11124 5D	W75-11327 5D
Total Waste Recycle System for Water Purifi- cation Plant Using Alum as Primary Coagulant, W75-11094 5D	The Economy of Various Methods for De- watering Sludge From Biological Purification (Ueber die Wirtschaftlichkeit verschiedener	Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 2). Pretreatment of Poultry-Processing Wastes,
The Effects of Free Ammonia and Free	Verfahren zur Entwaesserung von	W75-11329 5D
Nitrous Acid on the Nitrification Process, W75-11101 5D	biologischem Klaerschlamm), W75-11127 5D	Mill Experience in the Treatment of Mechani- cal Pulping Effluent,
Measures of Biodegradability and Refractory	Water Quality Control in Sewage Water Treat-	W75-11332 SE
Organics in Wastewaters: (Analysis, Interpreta-	ment, (In Japanese), W75-11133 5D	Papermaking Complex at Dunaujvaros
tion, and Application of Measurement Techniques), W75-11103 5D	Tensids (Syndets) and the Water Pollution	(Hungary) Preserving the Danube (Au com- plexe papetier de Dunaujvaros preserver le
	Problem, (Gesund-Heitliche Aspekte Des Ten- sid-Gebrauchs),	Danube), W75-11333 5E
Water Treatment by Ozone, (In Japanese), W75-11107 5D	W75-11134 5D	Solute-Solute Interactions in Ultrafiltration
Activated Carbon Adsorption Technique for	Interactions of Heavy Metals in the Activated Sludge Process,	Treatment of Paper Mill Wastes, W75-11334 51
Th: 1 C	W75-11173 5D	Evaluation of the Adsorptive Properties of Fly
Third Stage Sewage Water Treatment, (In Japanese),		
Japanese), W75-11108 5D	Treatment Plant Monitoring Programs: A	Ash with Reference to a Pulp and Paper Mil
Japanese),		
Japanese), W75-11108 5D On-Site Hypochlorite Generation,	Treatment Plant Monitoring Programs: A Preliminary Analysis,	Ash with Reference to a Pulp and Paper Mil Waste Effluent,

WASTE WATER TREATMENT

Measures in the Sulfite Pulp Industry for	Chromatographic Determination of Phenols in	WATER HYACINTH
Decreasing Waste Water Load (Massnahmen der Sulfitzellstoff-Industrie zur Minderung der	Water, W75-11344 5A	Comparison of Uredo Eichhorniae, the Water- hyacinth Rust, and Uromyces Pontederiae,
Abwasserbelastung),		W75-11092 5G
W75-11339 5D	WATER BALANCE Approximate Annual Water Budgets of Two	Onestian Class Swan
Effect of Lime Treatment on Molecular Weight	Chained Pinyon-Juniper Sites,	Operation Clean Sweep, W75-11192 5G
Distribution of Color Bodies from Kraft Liner-	W75-10896 4A	
board Decker Effluents,	WATER CHEMISTRY	Aquatic Plant Control on Lake Corpus Christi, W75-11194 5G
W75-11345 5D	Near-Bottom Chemistry in the Eastern Pacific	W75-11194 5G
Treating Effluents from a Sulphite Pulp Mill by	and North Atlantic Oceans,	CO2 Laser Effects on Water Hyacinth,
Flotation,	W75-10923 2K	W75-11209 5G
W75-11347 5D	A Study of Factors Controlling the Chemical	Water Hyacinth Research in Puerto Rico,
Study of Electrochemical Treatment Method	Quality of Water in Cartwright Creek Basin,	W75-11215 5G
for Removing Colloidal Particles from Pulp and	Williamson County, Tennessee, W75-11164 2K	WATER JETS
Paper Industry Effluents (Tutkimus selluteol- lisuuden jatevesien kolloidaalisten ainesten		The Mechanics of Rock Failure Due to Water
poistomahdollisuudesta sahkokemialliesti),	WATER CONSERVATION	Jet Impingement,
W75-11348 5D	An Appraisal of Potential Water Salvage in the Lake McMillen Delta Area, Eddy County, New	W75-11272 8E
WASTEWATER TREATMENT	Mexico,	WATER LAW
Disinfecting Wastewater with Chlorina-	W75-10941 3B	Human Obstacles to the Control of the
tion/Dechlorination Part 2,	Water Conservation in Sweden: III. Current	Hydrological Cycle for the Benefit of Man,
W75-10964 5D	Trends,	W75-10866 2A
WATER	W75-10987 5G	Impact of Energy Development on the Law of
Extraction and Analytical Techniques for Pesti-	Water Application Practices and Landscape At-	the Colorado River,
cides in Soil, Sediment, and Water,	tributes Associated with Residential Water	W75-10869 4C
W75-11236 - 5A	Consumption,	Information as a Regulatory Tool in Water
WATER ALLOCATION (POLICY)	W75-11059 3D	Quality Control,
Impact of Energy Development on the Law of	WATER CONSUMPTION	W75-10903 5G
the Colorado River, W75-10869 4C	Water Consumption and Water Turnover of Sheep Grazing Semiarid Pasture Communities	WATER LEVEL FLUCTUATIONS
W 75-10007	in New South Wales,	Water Level Manipulation: A Tool for Aquatic
The Law of Water Allocation in Kentucky,	W75-10888 3F	Weed Control,
W75-10898 6E	WATER COSTS	W75-11216 4A
WATER ANALYSIS	Facing the Real Cost of Clean Water,	WATER LEVELS
The Geochemical Cycle of Arsenic in Lake	W75-10857 5G	Automated Hourly Computations,
Washington and its Relation to Other Elements, W75-10922 5B	WATER DEMAND	W75-10915 7C
W 75-10922	Improved Design and Operating Criteria for	WATER MANAGEMENT (APPLIED)
Specific Conductance Method for in Situ Esti-	Rural Water Districts,	Man's Influence on the Hydrological Cycle: A
mation of Total Dissolved Solids, W75-11167 5A	W75-11056 6D	Draft Report of the UNESCO/FAO Working Group on the International Hydrological
	WATER DISTRIBUTION (APPLIED)	Decade.
Some Observations Concerning Preparation and Storage of Stream Samples for Dissolved	The Law of Water Allocation in Kentucky, W75-10898 6E	W75-10863 2A
Inorganic Phosphate Analysis,		Balancing the Effects of Man's Actions on the
W75-11336 5A	Hierarchial Model for Water-Supply-System	Hydrological Cycle,
Determination of Chemical Oxygen Demand,	Control, W75-10996 4A	W75-10865 2A
COD(Cr), in Waste Waters of Pulp and Paper		Study of Criteria and Models Establishing Op-
Mills (Bestimmung des chemischen Sauerstoff-	Improved Design of Distribution Networks by	timum Level of Hydrogeologic Information for
bedarfes, CSB(Cr), in Restabwaessern von	Minimum Route, W75-11175 4A	Groundwater Basin Management, W75-11042 2F
Zellstoff und Papierfabriken). W75-11337 5A		W75-11042 2F
	Distribution-System Operation Analysis Model, W75-11180 5D	Consolidation and Rehabilitation of Canals in
Interference of Mercury(II) in the Colorimetric		Poudre Valley,
Determination of Inorganic Phosphate in Water,	Computer Analysis of Water-Distribution	W75-11061 4A
W75-11340 5A	Systems, W75-11182 4A	The Louisiana Environmental Management
Modification of the Iodimetric Titration		System and Its Utility in Water Resource
Method for the Determination of Bromide and	Advanced Techniques in the Mathematical	Planning, W75-11177 5G
Its Application to Mixed Domestic-Industrial	Modeling of Water-Distribution Systems, W75-11183	
Waste Effluents,		The Water Industry in Transition,
W75-11341 5A	Macroscopic Distribution-System Modeling, W75-11185	W75-11252 3E
Apparatus for Concentration of Volatile Or-		Upgrading Poultry-Processing Facilities to
ganic Pollutants in Water,	Finite-Element Method for Water-Distribution	Reduce Pollution. (Part 1). In-Process Pollution
W75-11342 5A	Networks, W75-11186 4A	Abatement, W75-11328 51
Interference of Sulfate Ion on SPADNS		
(Sodium 2-(Sulfophenylazo)-1,8-Dihydrox-	WATER DISTRICTS	WATER PERMITS Information as a Regulatory Tool in Water
ynaphthalene-3,6-Disulfonate) Colorimetric Determination of Fluorine in Waste Waters,	Improved Design and Operating Criteria for Rural Water Districts,	Quality Control,
W75-11343 5A	W75-11056 6D	W75-10903 5G

Institutional Arrangements for Reducing Con-	Impact of Thermal Effluent from Steam-Elec-	Liquid CO2 Protects our Water's Quality, W75-10990 5F
flict Over Water Quality in International	tric Station on a Marshland Nursery Area dur-	NO
Rivers, W75-11242 6E	ing the Hot Season, W75-11032 5C	Milestone Water Legislation Accompanied by Millstone of Bureaucratic Red Tape, W75-11007 5G
The Water Industry in Transition,	The Toxicity of Drilling Fluid Components to	W/3-1100/
W75-11252 3E	Aquatic Biological Systems, A Literature Review,	Freshwater Ecosystem Research in Water Quality Management,
WATER POLLUTION	W75-11266 5C	W75-11012 6G
Design ConsiderationsWater and Effluent		
Disposal,	Fertilizer Phosphate in Streams and Lakes, W75-11310 5B	System for Optimal Pressure Control in a Multi-Stage Evaporation Unit,
W75-11128 5D		W75-11070 3A
Water Pollution from Nonpoint Sources,	Natural and Fertilizer Nitrogen in Streams and	Continue to Mariania of Suface
W75-11158 5B	Lakes, W75-11311 5B	Continuous Automatic Monitoring of Surface Water with Fish,
Behavior of Mn, Fe, Cu, Zn, Cd and Pb	WATER BOLL UTION COURCES	W75-11079 5A
Discharged from a Wastewater Treatment Plant into an Estuarine Environment,	WATER POLLUTION SOURCES Quality of Water in Aquifers of the Amargosa Desert and Vicinity, Nevada,	A Mathematical Model for Optimal Waste Load Allocations,
W75-11160 5B	W75-10932 5B	W75-11102 5G
# 1 - C - 1 - C (T) F 1 - 1 - 1	H	Concentration and Genera of Algae in Selected
Chelation Study of Copper (II): Fulvic Acid System, W75-11219 5B	Heavy Metals and Other Trace Elements, W75-10934 5B	Illinois Streams, 1971-1973, W75-11165
W15-11219 3B	Preventing Backflow in Piping Cross Connec-	
Measures in the Sulfite Pulp Industry for	tions,	Institutional Arrangements for Reducing Con-
Decreasing Waste Water Load (Massnahmen der Sulfitzellstoff-Industrie zur Minderung der	W75-11018 5B	flict Over Water Quality in International Rivers,
Abwasserbelastung),	Water Pollution from Nonpoint Sources,	W75-11242 6E
W75-11339 5D	W75-11158 5B	
W/3-11339	WATER POLLUTION TREATMENT	WATER QUALITY CONTROL
WATER POLLUTION CONTROL Water Pollution Problems in Salisbury, Rhode-	Preliminary Investigations into Copper Cycling	The Responsibility of U.S. Water Suppliers, W75-10856 5G
sia: Present and Future,	in Indian Lake, Massachusetts: A Lake Treated	The Impact of the Safe Drinking Water Act on
W75-10983 5G	Annually with Copper Sulfate, W75-11039 5B	Utilities,
Role and Responsibilities of the Environmental	System for Optimal Pressure Control in a	W75-10859 5G
Protection Service (Canada),	Multi-Stage Evaporation Unit,	Use of Productivity of Periphyton to Estimate
W75-11000 6G	W75-11070 3A	Water Quality,
1172 11700	11,10	W75-10936 5B
Oil Spill Technology,	Oil Separator with Coalescing Media,	The same of the sa
W75-11001 5G	W75-11071 5G	Device for Automatic Determination of
	The state of the s	Suspended Solids Content in Water,
Water Resources,	Upgrading Metal-Finishing Facilities to Reduce	W75-11063 5A
W75-11003 5G	Pollution. (Part 1). In-Process Pollution Abatement.	System for Softening and Dealkalizing Water
	W75-11324 5D	by Electrodialysis,
YWA Plan for Cleaner Rivers,	W 75-11324	W75-11065 5F
W75-11017 5D	Upgrading Metal-Finishing Facilities to Reduce	1175 11005
Device for Automotic Determination of	Pollution. (Part 2). Waste Treatment,	Oil Separator with Coalescing Media,
Device for Automatic Determination of Suspended Solids Content in Water,	W75-11325 5D	W75-11071 5G
W75-11063 SA		I T T T T T T T T T T T T T T T T T T T
W/3-11003	THE LAST TAKES OF THE	Low Temperature Water Purification System, W75-11074 5F
A Mathematical Model for Optimal Waste	A Pneumatic System to Pump Water from	W/3-110/4
Load Allocations,	Piezometers, W75-11257 8C	The Water Quality and Bottom Sediment
W75-11102 5G		Characteristics of New Jersey Lagoon
	Water System Accessories,	Developments,
Water Quality Control in Sewage Water Treat- ment, (In Japanese),	W75-11299 8C	W75-11104 5B
W75-11133 5D	WATER PURIFICATION	Problems of Liquid Waste Disposal,
	Liquid CO2 Protects our Water's Quality,	W75-11112 5G
Treatment Plant Monitoring Programs: A	W75-10990 5F	A Planning of Catchment Sewerage for Oyodo
Preliminary Analysis,	Electrolytic Sea Water Process,	River (In Japanese),
W75-11176 5D	W75-11068 3A	W75-11113 / 5D
Translations on Environmental Quality, No. 33.		
W75-11246 5G	Process for Raw Water Clarification, W75-11072 5F	Water Treatment for Public Supply, W75-11119 5F
Economic Analysis of Effluent Guidelines:		
Meat Packing Industry.	Low Temperature Water Purification System,	A New Look at Pollution Prevention or
W75-11249 5G	W75-11074 5F	Lowland Rivers,
30	Flocculation Device for Waste Fluid Treat-	W75-11132 50
Economic Analysis of Effluent Guidelines. Fer-	ment.	Simulation of Water Quality Management Poli
roalloys Industry.	W75-11077 5D	cies.
W75-11250 5G	35	W75-11181 5G
	WATER QUALITY	11 24 11 11
B(ritish) C(olumbia) Presses for Forest Indus-	Water Conservation in Sweden: III. Current	WATER QUALITY STANDARDS
tries Clean-Up.	Trends,	The Responsibility of U.S. Water Suppliers,
W75-11350 5G	W75-10987 5G	W75-10856 SC

SUBJECT INDEX

WATER QUALITY STANDARDS

The Impact of the Safe Drinking Water Act on Utilities.	WATER SOFTENING System for Softening and Dealkalizing Water	A Note on Salinity and Temperature in Some Moroccan Brackish Waters,
W75-10859 5G	by Electrodialysis,	W75-10997 2L
Activated Carbon in the Water Treatment	W75-11065 5F	The Influence of the Warm Cooling Water from
Plant.	WATER SOURCES	a Fossil Fueled Power Plant on Oceanographic
W75-10992 5D	An Assessment of Snowpack Depletion-Sur-	Conditions and Composition of Plankton in
Drug Resistant Coliforms Call for Re-Evalua-	face Runoff Relationships on Forested	Owase Bay I. Water Temperature in Relation to
tion of Water Quality Standards,	Watersheds,	Distribution of Microplankton, (In Japanese),
W75-11130 5B	W75-11049 4A	W75-11030 5C
B	WATER STORAGE	Note on the Measurement of the Response of
Registration of Herbicides for Aquatic Use, W75-11197 5G	Could The Sea be Used to Store Water for	Oceanographic Temperature Sensors, W75-11146 7B
W. Carlot D. Car	SupplyA Possible Scheme,	W75-11146 7B
WATER REQUIREMENTS Water Consumption and Water Turnover of	W75-11129 4A	WATER TEMPERATURE FREQUENCY
Sheep Grazing Semiarid Pasture Communities	WATER SUPPLY	DISTRIBUTION
in New South Wales,	Impact of Energy Development on the Law of	Temperatures of Kansas Streams, W75-10933 2E
W75-10888 3F	the Colorado River, W75-10869 4C	W 75-10933
WATER RESOURCES	W75-10869 4C	WATER TRANSFER
Water Resources of the Lower St. Croix River	Ozone Treatment Licks Color Problem.	Interbasin Water Transfers: A Case Study in
Watershed, East-Central Minnesota,	W75-10959 5D	Mexico, W75-10879 4A
W75-10945 7C	Hierarchial Model for Water-Supply-System	W 13-10017
Water Resources of the Snake River	Control,	An Implicit Approach to Pricing Agricultural
Watershed, East-Central Minnesota,	W75-10996 4A	Water Transfers to Urban Uses, W75-11178 4A
W75-10946 7C	Herizontal Groundwater Callectors, Hudraulies	W75-11178 4A
Water Resources of the Lower Minnesota	Horizontal Groundwater Collectors, Hydraulics and Design,	WATER TREATMENT
River Watershed, South-Central Minnesota,	W75-10998 8B	Organic Color in Groundwater of Mississippi,
W75-10947 7C		W75-10907 5F
Water Resources of the Cannon River	Horizontal Groundwater Collectors, 'Canada's Largest Water Well',	Water and Wastewater Disinfection with
Watershed, Southeastern Minnesota,	W75-10999 8B	Ozone: A Critical Review,
W75-10948 7C		W75-10956 5D
Land and Water Resources Survey in the Jebel	A Waterborne Gastroenteritis Epidemic in Pico	Liquid CO2 Protects our Water's Quality,
Marra Area, The Sudan.	Rivers, California, W75-11005 5F	W75-10990 5F
W75-11139 4A	W 75-11005	City/Township Joint Venture A New Water
Computer Systems and Water Resources	Induced Infiltration Supply System Among Big-	Plant,
Computer Systems and Water Resources, W75-11174 6A	gest. W75-11010 5F	W75-11015 5F
	W/3-11010	How Silica Affects Iron Removal from
WATER RESOURCES DEVELOPMENT	City/Township Joint Venture A New Water	Groundwater,
Man's Influence on the Hydrological Cycle: A Draft Report of the UNESCO/FAO Working	Plant,	W75-11016 5F
Group on the International Hydrological	W75-11015 5F	Commiss by Domestic Waters
Decade.	Endemic Nephrophathy and Its Relation to the	Corrosion by Domestic Waters, W75-11062 5F
W75-10863 2A	Contamination of Well Water by Phenolic	
Human Obstacles to the Control of the	Compounds in Barsa-Arad (Nefropatia En- demica Si Relatia Cu Impurificarea Prin Com-	System for Softening and Dealkalizing Water
Hydrological Cycle for the Benefit of Man,	pousi Fenolici in Apele Fintinilor Din Comuna	by Electrodialysis, W75-11065 5F
W75-10866 2A	Barsa-Arad),	
Interbasin Water Transfers: A Case Study in	W75-11105 5B	Process for Raw Water Clarification, W75-11072 5F
Mexico,	Could The Sea be Used to Store Water for	W75-11072 5F
W75-10879 4A	SupplyA Possible Scheme,	Low Temperature Water Purification System,
The Louisiana Environmental Management	W75-11129 4A	W75-11074 5F
System and Its Utility in Water Resource	A Practical Way to Find Minimum Prainage	Total Waste Recycle System for Water Purifi-
Planning,	A Practical Way to Find Minimum Drainage Area for a Well,	cation Plant Using Alum as Primary Coagulant,
W75-11177 5G	W75-11290 4B	W75-11094 5D
WATER RESOURCES DEVELOPMENT ACT	WATER CURN IN DEVEL OBJECT	Water Treatment by Ozone, (In Japanese),
The Responsibility of U.S. Water Suppliers,	WATER SUPPLY DEVELOPMENT The Responsibility of U.S. Water Suppliers,	W75-11107 5D
W75-10856 5G	W75-10856 5G	Ontinum Values for Operational Variables in
WATER REUSE		Optimum Values for Operational Variables in Turbidity Removal,
Changes in Vegetation and Surface Soil Proper-	A New Look at Pollution Prevention on Lowland Rivers,	W75-11110 5D
ties Following Irrigation of Woodlands with Municipal Wastewater,	W75-11132 5G	Water Treatment for Duklin Supply
W75-11243 5B		Water Treatment for Public Supply, W75-11119 5F
	Water System Accessories,	
Vacuum Distillation/Vapor Filtration Water Recovery,	W75-11299 8C	Distribution-System Operation Analysis Model,
W75-11315 5D	WATER SYSTEM ACCESSORIES	W75-11180 5D
	Water System Accessories,	Can a Computer Really Operate a Water-Filtra-
Possibilities of Reutilization of Kaolin from Biological Waste Water Sludges	W75-11299 8C	tion Plant,
(Moeglichkeiten der Wiederverwertung von	WATER TEMPERATURE	W75-11184 5F
Kaolin aus biologischen Abwasserchlaemmen),	Temperatures of Kansas Streams,	Algae in Baltimore's Reservoirs,
W75-11349 5D	W75-10933 2E	W75-11221 5C

Electrolytic Control of Algae,	Watershed Management in the Black Hills: The	WEST GERMANY
W75-11228 5F	Status of Our Knowledge,	Translations on Environmental Quality, No. 33.
WATER UTILIZATION	W75-11318 4D	W75-11246 5G
Subsurface Water Tool for Petroleum Ex-	WATERSHEDS (BASINS)	WEST AID OWIN A STON
ploration,	Factors Affecting Erosion in a Semi-Arid	WET AIR OXIDATION Carbon Regeneration by Wet Air Oxidation,
W75-11289 4B	Watershed,	W75-10988 5D
WATER WELLS	W75-10884 2J	WIND A V PIG
Horizontal Groundwater Collectors, 'Canada's	Designation of Surface Water I as Time for Co-	WHALES
Largest Water Well',	Derivation of Surface Water Lag Time for Con-	Mercury Content of Whales, (In Japanese),
W75-10999 8B	verging Overland Flow, W75-11156 2E	W75-11029 5B
	4E	WHITE AMUR
How to Seal Tubing Collar Leaks. W75-11287 8C	Dissipation of Residues of Phenoxy Herbicides Applied to the Watershed,	Unisex Studies on the White Amur, W75-11205 5C
Casing-Seat Testing - Why and How,	W75-11213 5B	WHITE HOUSE CANDY I OAM
W75-11291 8F	WAVES (WATER)	WHITE-HOUSE SANDY LOAM Seasonal Variations in the Infiltration Rate of a
	Wave Motion in Rockfill,	Whitehouse Soil in Southern Arizona,
Cementing Today's Problem Wells. W75-11293 8F	W75-10924 8D	W75-10873 2G
W/3-11223		
WATER YIELD IMPROVEMENT Effects of Pinyon-Juniper Removal on Natural	Effects of Entrance Loss on Harbor Oscilla- tions,	WHITE WATER Solute-Solute Interactions in Ultrafiltration
Resource Products and Uses in Arizona,	W75-11147 8B	Treatment of Paper Mill Wastes,
W75-10886 3B	Laboratory Investigation of One-Dimensional	W75-11334 5D
Development of a Ribliographic Information	Wave Motion in Open Channels,	WILTING
Development of a Bibliographic Information System for Water Yield Improvement Prac-	W75-11172 8B	The Role of Endogenous Abscisic Acid in the
tices.		Response of Plants to Stress,
W75-11050 10B	WEATHER PATTERNS	W75-11319 3F
	International Development Strategies for the Sahel.	WIND-GENERATED WAVES
Hydrologic Relations on Undisturbed and Con-	W75-10861 4A	Effect of Pressure Gradient on Wind-Waves in
verted Big Sagebrush Lands: The Status of Our Knowledge,	W/3-10001	a Laboratory Channel,
W75-11313 4D	WEBER BASIN PROJECT (UTAH)	W75-11093 8B
	Social Impacts of Water Resources Develop-	WIND TIDES
WATERCOURSES (LEGAL ASPECTS)	ments and Their Implication for Urban and	WIND TIDES Effect of Pressure Gradient on Wind-Waves in
Cost Evaluation of Watercourse Management in Essex.	Rural Development: A Post Audit Analysis of the Weber Basin Project in Utah,	a Laboratory Channel,
W75-11008 5G	W75-10854 6B	W75-11093 8B
117 1100	,	
WATERSHED MANAGEMENT	WEED CONTROL	WIND VELOCITY
An Analysis of the Motor-Row Conversion	Dissipation of Residues of Phenoxy Herbicides	Wind-Snow Relations at Marmot Creek, Al-
Issue of Colorado River Float Trips,	Applied to the Watershed,	berta, W75-11226 2C
W75-10867 6B	W75-11213 5B	W/3-11220
Shrub Transplanting for Watershed Manage-	WEIGHT	WINDS
ment and Range Improvement in Iran,	'Self-Tapping Screw' Bit Would Use Lighter	Wind Effects on Chemical Films for Evapora-
W75-10870 4D	Weights,	tion Suppression at Lake Hefner,
Seasonal Variations in the Infiltration Rate of a	W75-11283 8C	W75-10920 3B
Whitehouse Soil in Southern Arizona,	WELFARE (ECONOMICS)	WINTER
W75-10873 2G	The Economics of Flood Insurance: An Analy-	Economics of Great Lakes Shipping in an Ex-
Streamflow in the New York Part of the	sis of the National Flood Insurance Program,	tended Season, W75-11248 6C
Susquehanna River Basin,	W75-11038 6F	W 73-11248
W75-10931 2E	WELL CASINGS	WISCONSIN
Water Day of the Language Control Disease	Techniques for Linear Tie-Back Cementing,	Information as a Regulatory Tool in Water
Water Resources of the Lower St. Croix River Watershed, East-Central Minnesota,	W75-11277 8F	Quality Control,
W75-10945 7C	Special Annulus Fluid Eases Casing Recovery.	W75-10903 5G
	W75-11282 8G	Investigation of the Influence of Thermal
Water Resources of the Snake River	W 75-11262	Discharge from a Large Electric Power Station
Watershed, East-Central Minnesota, W75-10946 7C	WELL FILTERS	on the Temperature and Near-Shore Circula-
175-105-40	Colorado City Solves Its Sand Pumping	tion of Lake Michigan,
Water Resources of the Lower Minnesota	Problems,	W75-11190 5C
River Watershed, South-Central Minnesota,	W75-11261 8C	WISCONSIN DEPARTMENT OF NATURAL
W75-10947 7C	WELL PITS	RESOURCES
Water Resources of the Cannon River	Pitless Adapters: Emphasis on Sanitation,	The Awareness of the Relevant Water
Watershed, Southeastern Minnesota,	W75-11258 8C	Resources Literature by the Personnel of the
W75-10948 7C	WELL REGULATIONS	Wisconsin Department of Natural Resources, W75-10899 10C
Development of a Bibliographic Information	Pitless Adapters: Emphasis on Sanitation,	W75-10899 10C
System for Water Yield Improvement Prac-	W75-11258 8C	WITHDRAWAL
tices,		Non-Renewable, Non-Energy Resources,
W75-11050 10B	WELLS	W75-11253 6B
' Hotel at the state of the sta	Pitless Adapters: Emphasis on Sanitation,	WORMS
Hydrologic Relations on Undisturbed and Con- verted Big Sagebrush Lands: The Status of Our	W75-11258 8C	Some Effects of Copper on the Polychaete
Knowledge.	How to Make Squeeze Cementing Successful,	Phyllodoce Maculata,
W75-11313 4D	W75-11286 8F	W75-11136 5C

WORTHINGTON (MASS)

WOR		

Map Showing Depth to Bedrock, Worthington Quadrangle, Massachusetts, W75-10951

YAVAPAI COUNTY (ARIZ)
Hydrogeology and Water Resources of Middle
Kirkland Creek Basin, Yavapai County, Arizona. W75-10872

YELLOWTAIL

Studies on Toxicity of Sodium Nifurstyrenate (NFS-NA) in Cultured Yellowtail (In Japanese). W75-11034 5C

The Accumulation of Cadmium, Copper, Manganese and Zinc by Fucus Vesiculosus in the Bristol Channel, W75-11083

Uptake of Cadmium, Zinc, Copper, Lead and Chromium in the Pacific Oyster, Crassostrea Gigas, Grown in the Tamar River, Tasmania, W75-11086

Studies on the Inorganic Components of Marine Animals-III, on the Contents of Cadmium, Zinc, Copper, Lead and Iron in Muscle and Viscera of Marine Animals Captured in the West Sea Area of Kyushu, (In Japanese), W75-11087

ZOOPLANKTON

Ammonia Excretion by Zooplankton and its Significance to Primary Productivity During Summer. W75-11187

Seasonal Abundance of Crustacean Zooplankton and Net Plankton Biomass of Lakes Huron, Erie, and Ontario,

W75-11238

AUTHOR INDEX

ABBOTT, C. E.	ANDREWS, W. H.	BAIRD, J. H.
Charged Droplet Collision Efficiency Measure-	Social Impacts of Water Resources Develop-	Cost Evaluation of Watercourse Management
ments,	ments and Their Implication for Urban and	in Essex,
W75-11168 2B	Rural Development: A Post Audit Analysis of the Weber Basin Project in Utah.	W75-11008 5G
AITKEN, A. P.	W75-10854 6B	BAKER, M. B.
Hydrologic Investigation and Design of Urban	W 75-10654 0B	Effects of Pinyon-Juniper Removal on Natural
Stormwater Drainage Systems,	ANTHONISEN, A. C.	Resource Products and Uses in Arizona,
W75-11141 4A	The Effects of Free Ammonia and Free	W75-10886 3B
AL-LAYLA, M. A.	Nitrous Acid on the Nitrification Process,	DATE A I
Optimum Values for Operational Variables in	W75-11101 5D	BALE, A. J. The Accumulation of Cadmium, Copper, Man-
Turbidity Removal,	1991V G G	ganese and Zinc by Fucus Vesiculosus in the
W75-11110 5D	APPAN, S. G.	Bristol Channel,
	Stabilization and Reconstruction of Texas	W75-11083 5B
ALCORN, S. R.	Coastal Foredunes with Vegetation,	W75-11005
Limnology of Desert Ponds,	W75-10887 2L.	BALL, J. W.
W75-10880 2H	APPEL, D. W.	Predicting Cavitation in Sudden Enlargements,
ALDON, E. F.		W75-11151 8B
Establishing Alkali Sacaton on Harsh Sites in	Aerobic Lagoon Waste Treatment System and	
the Southwest,	Method, W75-11069 5D	BANNERT, C.
W75-10882 4A	W75-11069 5D	Oxidation of Organic Compounds in Water
	APPLETON, B.	(Oxidation organischer Verbindungen in
Revegetating Disturbed Areas in the Semiarid	ICI's Deep Shaft 'Halves Sludge Volume',	Wasser),
Southwest,		W75-11118 5D
W75-10892 4D	W75-10981 5D	BADABAS S
	YWA Plan for Cleaner Rivers,	BARABAS, S. Advances in the Detection of Water Pollutants,
ALETI, A.	W75-11017 5D	W75-10995 5A
Water Pollution from Nonpoint Sources,		W 75-10995
W75-11158 5B	ARAGAKI, T.	BARE, W. F. R.
ALEXANDER, M.	Slurry Deliquoring by Expression,	Algae Removal Using Dissolved Air Flotation,
Stability of Nitrosamines in Samples of Lake	W75-10969 5D	W75-10978 5D
Water, Soil, and Sewage,		
W75-11019 5B	ARAZAKI, S.	BARLOW, J. P.
	Some Observations on Behavior of the Treated	Utilization of Stream-Borne Phosphorus by
ALEXANDER, S. M.	Sewage Disposed in the Sea,	Cayuga Lake Phytoplankton,
Advanced Techniques in the Mathematical Modeling of Water-Distribution Systems,	W75-11020 5B	W75-11036 5C
W75-11183 4A	ARIMA, S.	BARNARD, J. L.
	Mercury Content of Whales, (In Japanese),	Desirable Provision in Current Designs for Fu-
ALLEN, R. M.	W75-11029 5B	ture Development in Relation to Reclamation
Phytophthora Species in Arizona: Its Occur-		of Effluent,
rence in Recycled Irrigation water,	ATKINS, A.	W75-10980 5D
W75-10883 5A	Economics of Great Lakes Shipping in an Ex-	BARNES, W. W.
ALLISON, S. V.	tended Season,	Dissipation of Residues of Phenoxy Herbicides
Successful Irrigation: Preparation, Realization,	W75-11248 6C	Applied for Water Milfoil Control in Large
Exploritation, (Savoir Irriguer: Preparation,	AMERICAL S. I.	Reservoirs.
Realisation, Exploitation),	AUERBACH, S. I.	W75-11198 5B
W75-10874 3F	Freshwater Ecosystem Research in Water	30
ALLWOOD I V	Quality Management,	BARRY, J. R.
ALLWOOD, J. K.	W75-11012 6G	Field Testing of Aquatic Herbicides for Control
Economic Analysis of Effluent Guidelines:	AUSNESS, R. C.	of Egeria Densa,
Meat Packing Industry, W75-11249 5G	The Law of Water Allocation in Kentucky,	W75-11200 5G
W75-11249 5G	W75-10898 6E	DATEMAN C I
ALONSO, C. V.	OL CONTRACTOR OF THE CONTRACTO	BATEMAN, S. J. Simple Field Checks Will Provide Accurate
Some Results on Mass Transfer Processes in a	AYLING, G. M.	Simple Field Checks Will Provide Accurate DST Data.
Density-Stratified Flow,	Uptake of Cadmium, Zinc, Copper, Lead and	W75-11281 8G
W75-11057 8B	Chromium in the Pacific Oyster, Crassostrea	11.7-11201 8U
AMPIRE A	Gigas, Grown in the Tamar River, Tasmania,	BAUERLE, B.
AMEIN, M.	W75-11086 5B	The Use of Snakes as a Pollution Indicator
Implicit Numerical Modeling of Unsteady	AUDEC V W	Species,
Flows,	AYRES, K. W.	W75-11089 5B
W75-10925 8B	Soil Morphology and Soil Physical Properties:	
ANDERSON, H. W. JR.	II. Mechanical Impedance and Moisture Reten-	BAUR, J. R.
Water Resources of the Cannon River	tion and Movement, W75-10885 2G	Occurrence of 2, 4, 5-T and Picloram in Sur-
Watershed, Southeastern Minnesota,	W75-10885 2G	face Runoff Water in the Blacklands of Texas,
W75-10948 7C	BACK, W.	W75-10895 5B
W. D	Determination of Regional Hydraulic Conduc-	BAYLOR, E. R.
Water Resources of the Lower Minnesota	tivity Through Use of C-14 Dating of Ground-	Surface Tension Reductions and Urban Wastes
River Watershed, South-Central Minnesota, W75-10947 7C	water,	in The New York Bight,
W75-10947 7C	W75-10930 2F	W75-10927 5B
ANDERSON, J. W.		35
Biomagnification of Dieldrin Residues by Food	BAILEY, M. W.	BEALL, S. E.
Chain Transfer from Clams to Blue Crabs	Solute-Solute Interactions in Ultrafiltration	Status of Waste Heat Utilization and Dual-Pur-
Under Controllled Conditions,	Treatment of Paper Mill Wastes,	pose Plant Projects,
W75.11135 SC	W75-11334 5D	W75-11251 3E

AUTHOR INDEX

BEARDSLEY, G.

BEARDSLEY, G.	BETZER, S. B.	BRADLEY, B. P.
\$3-Million and Two-and-a-Half Years to Solve	Copper Toxicity in Busycon Canaliculatum L.,	Adaptation of Copepod Populations to Thermal
Campbell River's Sewage Problems,	W75-11031 5C	Stress,
W75-10977 5D		W75-11046 5C
	BEUSCHER, D. B.	
BECKER, D. A.	Concentration and Genera of Algae in Selected	BRAND, W. E.
	Illinois Streams, 1971-1973,	
Pathogenic Free-Living Amoebae in Arkansas		Design ConsiderationsWater and Effluent
Recreational Waters,	W75-11165 5A	Disposal,
W75-11053 5A		W75-11128 5D
775	BHATTACHARYYA, B.	W/5-11120
PROFESCIAL PROFIT	Electrolytic Control of Algae,	**************************************
BECKSCHAFER, K.		BRISCOE, E. R. E.
Flocculation Device for Waste Fluid Treat-	W75-11228 5F	Huntingdon Research Centre Pasveer Oxida-
ment,	Annual Control and Annual Contro	tion PlantSix Years On,
	BIALAS, W. F.	
W75-11077 5D	Prescriptive Economic Models for Nonstruc-	W75-11115 5D
	tural Flood Control,	
BEETEM, W. A.		BROOKER, M. P.
Quality of Water in Aquifers of the Amargosa	W75-11060 6F	Cost Evaluation of Watercourse Management
Desert and Vicinity, Nevada,	BIRD, D. W.	in Essex,
W75-10932 5B	Advanced Techniques in the Mathematical	W75-11008 5G
BEICHLEY, G. L.	Modeling of Water-Distribution Systems,	BROUSSARD, W. L.
	W75-11183 4A	
Cavitation Control by Aeration of High-		Water Resources of the Cannon River
Velocity Jets,	BISHNOI, O. P.	Watershed, Southeastern Minnesota,
W75-11152 8B		
W /3-11132 OD	Estimation of Safe Periods for Crop Planning	W75-10948 70
	Under Dryland Agriculture,	
BELL, D. T.	W75-10926 3F	Water Resources of the Lower Minnesota
Guidelines for the Identification of Potential	11 13-10320	River Watershed, South-Central Minnesota,
	DI ACUDIDA D. D.	
Environmental Impacts in the Construction and	BLACKBURN, R. D.	W75-10947 7C
Operation of a Reservoir,	Chemical Control of Egeria Densa,	
W75-11316 5C	W75-11199 5G	Water Resources of the Lower St. Croix River
11/3/11/310		
	DI DOUGH II G	Watershed, East-Central Minnesota,
BELL, J. B.	BLECKER, H. G.	W75-10945 7C
Microbiological Examination of Offshore Lake	How to Estimate and Escalate Costs of Waste-	
Erie Sediments.	water Equipment,	Water Resources of the Snake River
W75-11218 5C	W75-11014 5D	Watershed, East-Central Minnesota,
		W75-10946 70
BELLA, D. A.	BLINCO, P. H.	
	Turbulent Structure Near Smooth Boundary,	PROWN I M A
Strategic Approach to Estuarine Environmental	W75-11148 8B	BROWN, J. M. A.
Management,	W /3-11146 OD	A Contribution to the Biology of Nitella
W75-11179 2L		Hookeri A. BR. in the Rotorua Lakes, New
W/3-111/2	BLOGOSLAWSKI, W. J.	
DELIDED D. P.	Effects of Ozone-Treated Seawater on the	Zealand. II. Organic Nutrients and Physical
BENDER, D. F.	Spawned, Fertilized, Meiotic, and Cleaving	Factors,
Modification of the Iodimetric Titration		W75-11235 50
Method for the Determination of Bromide and	Eggs of the Commercial American Oyster,	1175 11255
	W75-11256 5C	PROUNT C I
Its Application to Mixed Domestic-Industrial		BROWN, S. J.
Waste Effluents,	BONANSINGA, P.	. Upgrading Meat Packing Facilities to Reduce
W75-11341 5A		Pollution. (Part 2). Waste Treatment,
W/3-11341 3A	Computer Analysis of Water-Distribution	
	Systems,	W75-11321 5D
BENFORD, H.	W75-11182 4A	
Economics of Great Lakes Shipping in an Ex-	1170 11102	BRUECKNER, T. G.
	POND M T	Physiochemical Treatment of Wastewater-Sea-
tended Season,	BOND, M. T.	
W75-11248 6C	Organic Color in Groundwater of Mississippi,	water Mixture by Electrolysis,
	W75-10907 5F	W75-10979 5D
BENN, B. O.		
	BONE, L. W.	BUCHANAN, M. A.
Operations Platforms,		
W75-11210 4A	Pathogenic Free-Living Amoebae in Arkansas	Effect of Lime Treatment on Molecular Weight
	Recreational Waters,	Distribution of Color Bodies from Kraft Liner
BENNETT, G. H.	W75-11053 5A	board Decker Effluents.
Population Dynamics of Protozoa in Waste-		
	BOULDIN, D. R.	W75-11345 5E
water,		
W75-10957 5D	Some Observations Concerning Preparation	BUGLIARELLO, G.
	and Storage of Stream Samples for Dissolved	Computer Systems and Water Resources,
DEMMETT I E	Inorganic Phosphate Analysis,	
BENNETT, J. E.		W75-11174 6A
Electrolytic Sea Water Process,	W75-11336 5A	
W75-11068 3A	POURCEOUS P. O.	BUKATA, R. P.
311	BOURGEOIS, P. O.	The Utilization of Sun-Glint in a Study of Lake
BERRY, C. R.	Horizontal Groundwater Collectors, Hydraulics	
	and Design.	Dynamics,
Aquatic Plant Control Using Herbicides in a		W75-11239 5/
Large Potable Water Supply,	W75-10998 8B	
		BURANT, W. JR.
W75-11201 5G	BOVEY, R. W.	
All the second s	Occurrence of 2, 4, 5-T and Picloram in Sur-	Carbon Regeneration by Wet Air Oxidation,
		W75-10988 5I
BERTHOUEX, P. M.	form Donnell Water in the District of T	
	face Runoff Water in the Blacklands of Texas,	
Treatment Plant Monitoring Programs: A	face Runoff Water in the Blacklands of Texas, W75-10895 5B	BUDKUALTED T D
Treatment Plant Monitoring Programs: A Preliminary Analysis,		BURKHALTER, T. D.
Treatment Plant Monitoring Programs: A	W75-10895 5B	BURKHALTER, T. D. Criteria for Herbicide Evaluation,
Treatment Plant Monitoring Programs: A Preliminary Analysis,	W75-10895 5B BOWIE, J. E.	Criteria for Herbicide Evaluation,
Treatment Plant Monitoring Programs: A Preliminary Analysis, W75-11176 5D	W75-10895 5B BOWIE, J. E. Organic Color in Groundwater of Mississippi,	
Treatment Plant Monitoring Programs: A Preliminary Analysis, W75-11176 BEST, D. G.	W75-10895 5B BOWIE, J. E.	Criteria for Herbicide Evaluation, W75-11196
Treatment Plant Monitoring Programs: A Preliminary Analysis, W75-11176 5D	W75-10895 5B BOWIE, J. E. Organic Color in Groundwater of Mississippi,	Criteria for Herbicide Evaluation, W75-11196 50 BURNETT, E.
Treatment Plant Monitoring Programs: A Preliminary Analysis, W75-11176 5D BEST, D. G. Root:Shoot and Leaf Area Relationships of	W75-10895 5B BOWIE, J. E. Organic Color in Groundwater of Mississippi, W75-10907 5F	Criteria for Herbicide Evaluation, W75-11196
Treatment Plant Monitoring Programs: A Preliminary Analysis, W75-11176 5D BEST, D. G. Root:Shoot and Leaf Area Relationships of Macrophyte Communities in Chautauqua Lake,	W75-10895 5B BOWIE, J. E. Organic Color in Groundwater of Mississippi, W75-10907 5F BOYD, D. R.	Criteria for Herbicide Evaluation, W75-11196 50 BURNETT, E. Occurrence of 2, 4, 5-T and Picloram in Sur
Treatment Plant Monitoring Programs: A Preliminary Analysis, W75-11176 5D BEST, D. G. Root:Shoot and Leaf Area Relationships of	W75-10895 5B BOWIE, J. E. Organic Color in Groundwater of Mississippi, W75-10907 5F	Criteria for Herbicide Evaluation, W75-11196 50 BURNETT, E.

al C nt D

a-D

nt G

er C ta C er C er C

la wal C

e D

D

nt r-D

A

e A

D

G

r-

BURNS, C. V.	CHAPMAN, J. D.	Practical Application of Surface Fixed-System
Temperatures of Kansas Streams,	Algae Control in Northwest Reservoirs,	for Multi-Purpose Sprinkler Irrigation Uses, (In
W75-10933 2E	W75-11231 5G	Japanese), W75-11097 3F
BURNS, N. M.	CHAPMAN, V. J.	W/3-1109/
In Situ Measurement of the Settling Velocity	A Contribution to the Biology of Nitella	CHRISWELL, C. D.
Profile of Particulate Organic Carbon in Lake	Hookeri A. BR. in the Rotorua Lakes, New	Chromatographic Determination of Phenols in
Ontario,	Zealand. II. Organic Nutrients and Physical	Water,
W75-11227 5C	Factors,	W75-11344 5A
THE COMPANY OF A	W75-11235 5C	CHU, H-L.
BURSZTYNSKY, T. A.		Implicit Numerical Modeling of Unsteady
Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 1). In-Process Pollution	CHARI, K. V.	Flows,
Abatement,	Electrolytic Control of Algae,	W75-10925 8B
W75-11328 5D	W75-11228 5F	CINKE, J. E.
	CHARUDATTAN, R.	Electrolytic Sea Water Process,
BUSCH, C. D.	Comparison of Uredo Eichhorniae, the Water-	W75-11068 3A
Scheduling and Application Rates of Irrigation	hyacinth Rust, and Uromyces Pontederiae,	
in a Humid Climate,	W75-11092 5G	CLARY, W. P.
W75-11048 3F	There is a firm of the same of	Effects of Pinyon-Juniper Removal on Natural
BUTTON, R. G.	Utilization of Phytopathogens as Biocontrols	Resource Products and Uses in Arizona, W75-10886 3B
Soil Morphology and Soil Physical Properties:	for Aquatic Weeds, W75-11206 5G	W 73-10000 3B
II. Mechanical Impedance and Moisture Reten-	W75-11206 5G	CLESCERI, N. L.
tion and Movement,	CHEAM, V.	Freshwater Ecosystem Research in Water
W75-10885 2G	Chelation Study of Copper (II): Fulvic Acid	Quality Management,
CARLE N	System,	W75-11012 6G
CAINE, N.	W75-11219 5B	COCKS, P. S.
An Elevational Control of Peak Snowpack Variability,		The Early Vegetative Growth of Two Annual
W75-11155 2C	CHEATHAM, J. B. JR.	Pasture Grasses (Hordeum Leporinum Link
W/5-11155	Theory of Plasticity of Porous Media with	and Lolium Rigidum Gaud.),
CAMPBELL, D. E.	Fluid Flow,	W75-10876 3F
A Pneumatic System to Pump Water from	W75-11276 8E	The Commission and Establishment of Tour
Piezometers,	CHEATHAM, L. R.	The Germination and Establishment of Two Annual Pasture Grasses (Hordeum Leporinum
W75-11257 8C	A Case Study of Some Economic Aspects of	Link and Lolium Rigidum Gaud.),
CAMPBELL, R. E.	the National Flood Insurance Program,	W75-10897 2I
Effects of Pinyon-Juniper Removal on Natural	W75-10906 6F	
Resource Products and Uses in Arizona,	CHEN C.	The Influence of Density and Nitrogen on the
W75-10886 3B	CHEN, C-L.	Outcome of Competition Between Two Annual Pasture Grasses (Hordeum Leporinum Link
	Process Studies and Modeling of Self-Cleaning Capacity of Mountain Creeks for Recreation	and Lolium Rigidum Gaud.),
CARLOZZI, C. A.	Planning and Management,	W75-10889 3F
Environmental Impact Evaluation in Fresh-	W75-11055 5B	
water Impoundments by Vegetation Analysis of		COFFEY, P. E.
the Terrestrial Ecosystem, W75-10905 2I	CHENG, K. H.	Evidence of Atmospheric Transport of Ozone
1175-10703	An Investigation of Glycolate Excretion in Two	into Urban Areas, W75-11169 5A
CARLSON, F. R.	Species of Blue-Green Algae,	W/3-11105
Measurement of Cobble Abrasion in Natural	W75-11230 5C	COLES, S. L.
Streams,	CHENG, M. H.	A Comparison of Effects of Elevated Tempera-
W75-10881 2J	Interactions of Heavy Metals in the Activated	ture Versus Temperature Fluctuations on Reef
CARPENTER, G. F.	Sludge Process,	Corals at Kahe Point, Oahu, W75-11084 5C
Seasonal Abundance of Crustacean Zooplank-	W75-11173 5D	W/3-11064
ton and Net Plankton Biomass of Lakes Huron,		COLLINS, A. G.
Erie, and Ontario,	CHENOUARD, L.	Finite-Element Method for Water-Distribution
W75-11238 5C	Weyl's Theory of Glaciation Supported by	Networks,
CARR W. D. C.	Isotopic Study of Norwegian Core K 11,	W75-11186 4A
CARR, W. E. S.	W75-11153 2J	COLLINS, J. G.
Impact of Thermal Effluent from Steam-Elec- tric Station on a Marshland Nursery Area dur-	CHESTERS, G.	CO2 Laser Effects on Water Hyacinth,
ing the Hot Season,	Extraction and Analytical Techniques for Pesti-	W75-11209 5G
W75-11032 5C	cides in Soil, Sediment, and Water,	COLUMN I
	W75-11236 5A	COLLINS, L. A. A Survey of Fishes and Commercial Inver-
CARTER, R. M.	CHICALAN A A	tebrates of the Nearshore and Estuarine Zone
Mass-Emplaced Sand-Fingers at Mararoa Con-	CHISMAN, J. A.	Between Cape Romano and Cape Sable,
struction Site, Southern New Zealand,	Simulation of Water Quality Management Poli- cies,	Florida,
W75-11161 2J	W75-11181 5G	W75-11189 2I
CATROUX, G.		COLLINSON R
The Use of Soil as a Purifying System	CHIU, S. Y.	COLLINSON, B. Pilot-Plant Study of Denitrification Using a
(L'Utilisation du sol Comme Systeme Epu-	Water Pollution from Nonpoint Sources,	Submerged Sand Filter at Rye Meads Sewage
rateur),	W75-11158 5B	Works,
W75-11126 5D	CHO T	W75-10955 5D
CHANC D C	CHO, T. Cultivation of Netted Melon By Use of Trickle	COLMAN B
CHANG, R. C. Chromatographic Determination of Phenols in	Irrigation in a Sand Field Plastic Greenhouse,	COLMAN, B. An Investigation of Glycolate Excretion in Two
Water,	(In Japanese),	Species of Blue-Green Algae,
W75-11344 5A	W75-11095 3F	W75-11230 5C

CONRAD, J. R.

CONRAD, J. R.	CROW, F. R.	DECKER, C. S.
Anaerobic Acidogenesis of Wastewater Sludge, W75-10976 5D	Wind Effects on Chemical Films for Evapora- tion Suppression at Lake Hefner,	Acid Strip Mine Lake Recovery, W75-11224 5C
	W75-10920 3B	
CONWAY, K. E.	CHI PERCON C H	DEGAN, A.
Comparison of Uredo Eichhorniae, the Water-	CULBERSON, C. H. Near-Bottom Chemistry in the Eastern Pacific	Sprinkler Irrigation Practice, (La Pratique De L'Irrigation Par Aspersion),
hyacinth Rust, and Uromyces Pontederiae, W75-11092 5G	and North Atlantic Oceans,	W75-10875 3F
W75-11092 5G	W75-10923 2K	
COOK, C. W.		DEGUCHI, Y.
Guidelines for Revegetation and Stabilization	CULLEN, P. W. Fertilizer Phosphate in Streams and Lakes,	Some Observations on Behavior of the Treated Sewage Disposed in the Sea,
of Surface Mined Areas in the Western States,	W75-11310 5B	W75-11020 5B
W75-11100 4D	W/3-11310	
COPENHAVER, E. D.	CUMMINGS, J. C.	DEMOYER, R. JR.
Heavy Metals and Other Trace Elements,	Registration of Herbicides for Aquatic Use,	Macroscopic Distribution-System Modeling, W75-11185
W75-10934 5B	W75-11197 5G	W/3-11103
	CUMMINGS, R. G.	DEN HARTOG, H.
CORNING, R. V.	Interbasin Water Transfers: A Case Study in	The Economic Impact of Pollution Abatement:
Aquatic Plant Control Using Herbicides in a	Mexico,	The Case of Water Pollution by Degradable Or- ganic Matter,
Large Potable Water Supply, W75-11201 5G	W75-10879 4A	W75-11254 5G
W75-11201	DAHL, B. E.	
CORNISH, B. A.	Stabilization and Reconstruction of Texas	DENNIS, R. E.
Difficulties in Gauging Small Catchments - A	Coastal Foredunes with Vegetation,	Use of Amendments to Reduce Water Require-
Case Study,	W75-10887 2L	ments for Stand Establishment of Small-Seeded Crops,
W75-11306 2E	DANIEL, T. C.	W75-11045 3F
COSTIN, A. B.	Extraction and Analytical Techniques for Pesti-	
Balancing the Effects of Man's Actions on the	cides in Soil, Sediment, and Water,	DEVINE, R. F.
Hydrological Cycle,	W75-11236 5A	Interference of Sulfate Ion on SPADNS (Sodium 2-(Sulfophenylazo)-1,8-Dihydrox-
W75-10865 2A	DANNINGER, H.	ynaphthalene-3,6-Disulfonate) Colorimetric
	Measures in the Sulfite Pulp Industry for	Determination of Fluorine in Waste Waters,
COTTER, D. J.	Decreasing Waste Water Load (Massnahmen	W75-11343 5A
Water Application Practices and Landscape At- tributes Associated with Residential Water	der Sulfitzellstoff-Industrie zur Minderung der	DICKEY, E. E.
Consumption,	Abwasserbelastung),	Effect of Lime Treatment on Molecular Weight
W75-11059 3D	W75-11339 5D	Distribution of Color Bodies from Kraft Liner-
	DANTIN, E. J.	board Decker Effluents,
COULSON, J. R.	The Louisiana Environmental Management	W75-11345 5D
Biological Control of Alligator Weed, 1959- 1972,	System and Its Utility in Water Resource	DICKEY, P. A.
W75-11202 5G	Planning,	Review of Conference on Hydrology of Deep
	W75-11177 5G	Sedimentary Basins,
COURCHENE, J. E.	DAUCHER, H-H.	W75-10935 5B
Algae Control in Northwest Reservoirs,	Aeration by Means of Blast Nozzle A Possi-	DIETRICH, K. R.
W75-11231 5G	bility for the Aeration of Biological Waste	Simplified Waste Water Purification Through
COX, E. R.	Water Treatment Plants (Die Strahlduesen- begasungeine Moeglichkeit zur Belueftung	Physical-Chemical Treatment (Vereinfachte
An Appraisal of Potential Water Salvage in the	biologischer Klaeranlagen),	Abwasserreinigung durch physikalisch
Lake McMillen Delta Area, Eddy County, New	W75-11124 5D	chemische Behandlung), W75-11122 5D
Mexico,	P	W 75-11122
W75-10941 3B	DAVAVIN, I. A. Influence of Oil on Nucleic Acids of Algae,	DIXON, K. W.
COX, S. K.	W75-11080 5C	Process for Raw Water Clarification,
Analysis of Colorado Precipitation,		W75-11072 5F
W75-11040 2B	Influence of Oil on Nucleic Acids of Algae,	Process for Treating Industrial Wastes,
CON M. A	W75-11232 5C	W75-11066 5D
COX, W. A. Milestone Water Legislation Accompanied by	DAVIS, K. D.	Process for Treating Industrial Wastes,
Millstone of Bureaucratic Red Tape.	Process Studies and Modeling of Self-Cleaning	W75-11067 SD
W75-11007 5G	Capacity of Mountain Creeks for Recreation	
	Planning and Management, W75-11055 5B	Process for Treating Sewage Sludge,
CRANE, J. D.	W 75-11033	W75-11064 5D
Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 1). In-Process Pollution	DAVIS, L. R.	DOI, K.
Abatement.	Factors Affecting Erosion in a Semi-Arid	Uranium Mineralization by Ground Water in
W75-11328 5D	Watershed, W75-10884 2J	Sedimentary Rocks, Japan.
	W75-10884 2J	W75-11145 2F
CRECELIUS, E. A.	DE CONINCK, E.	DONALD, C. M.
The Geochemical Cycle of Arsenic in Lake	A Note on Salinity and Temperature in Some	The Early Vegetative Growth of Two Annua
Washington and its Relation to Other Elements, W75-10922 5B	Moroccan Brackish Waters,	Pasture Grasses (Hordeum Leporinum Link
эв	W75-10997 2L	and Lolium Rigidum Gaud.), W75-10876
CROFT, D. B.	DE JONG, E.	W / J-100/0
Water Application Practices and Landscape At-	Soil Morphology and Soil Physical Properties:	The Germination and Establishment of Two
tributes Associated with Residential Water	II. Mechanical Impedance and Moisture Reten-	Annual Pasture Grasses (Hordeum Leporinum
Consumption,	tion and Movement,	Link and Lolium Rigidum Gaud.),

		Alternation of the second of t
DOOGE, J. C. I.	EL-GAYAR, F. M.	FALL, B. A.
Balancing the Effects of Man's Actions on the	Standard Curves for Nuvacron, Malathion,	Stabilization and Reconstruction of Texas
Hydrological Cycle,	Sevin, DDT, and Kelthane Tested Against the	Coastal Foredunes with Vegetation,
W75-10865 2A	Mosquito Culex Pipiens L. and the	W75-10887 21.
	Microcrustacean Daphnia Magna Straus,	
The Nature and Components of the Hydrologi-	W75-11082 5B	FALLSIDE, F.
cal Cycle,	, , , , , , , , , , , , , , , , , , ,	Hierarchial Model for Water-Supply-System
W75-10864 2A	EL-SHAZLI, A. Y.	Control.
	Standard Curves for Nuvacron, Malathion,	W75-10996 4A
DORAN, D. G.		***
Droughts, Distributions and Dependence: An	Sevin, DDT, and Kelthane Tested Against the	FAN, L. T.
Analysis of Some Synthetic Data Generation	Mosquito Culex Pipiens L. and the	Design of the Optimal Outfall System for a
Methods,	Microcrustacean Daphnia Magna Straus,	Stream Receiving Thermal and Organic Waste
	W75-11082 5B	Discharges,
W75-11305 2E		
DOWNE, A. E. R.	ELEUTERIUS, L. N.	W75-11137 5B
	Transplanting Sea Grass in Mississippi Sound,	FARRELL, D. F.
The Effects of Experimental Blackfly (Diptera:	W75-11207 4A	Water Resources of the Cannon River
Simuliidae) Larviciding with Abate, Dursban,		
and Methoxychlor on Stream Invertebrates,	ELFVING, E.	Watershed, Southeastern Minnesota,
W75-11157 5C	Minitest Method for Monitoring Effluent Quali-	W75-10948 7C
	tv.	Water Daniel of the Yaman Million
DUBINSKY, Z.	W75-10994 5D	Water Resources of the Lower Minnesota
Relations Between Algal Populations and the	W. 10.74	River Watershed, South-Central Minnesota,
pH of Their Media,	ENGELS, P.	W75-10947 7C
Same reason		
W75-11028 5C	A Note on Salinity and Temperature in Some	Water Resources of the Lower St. Croix River
DUGAL, H. S.	Moroccan Brackish Waters,	Watershed, East-Central Minnesota,
	W75-10997 2L	W75-10945 7C
Effect of Lime Treatment on Molecular Weight		
Distribution of Color Bodies from Kraft Liner-	ENGLER, G.	FELSHEIM, P. E.
board Decker Effluents,	A Note on Salinity and Temperature in Some	Water Resources of the Cannon River
W75-11345 5D	Moroccan Brackish Waters,	Watershed, Southeastern Minnesota,
	W75-10997 2L	W75-10948 7C
DUGAN, G. L.		11.5.10.40
Nitrogen Removal in the Operation of the	EPSTEIN, H. S.	FELSTEHAUSEN, H. H.
Mililani Sewage Treatment Plant,	How to Estimate and Escalate Costs of Waste-	Information as a Regulatory Tool in Water
W75-11041 5D	water Equipment,	Ouality Control.
35	W75-11014 5D	
DUPLESSY, J. C.	W/5-11014 3D	W75-10903 5G
Weyl's Theory of Glaciation Supported by	ERICKSON, E. A.	PERDIC I
		FERRIS, J.
Isotopic Study of Norwegian Core K 11,	Changes in Vegetation and Surface Soil Proper-	Freshwater Ecosystem Research in Water
W75-11153 2J	ties Following Irrigation of Woodlands with	Quality Management,
	Municipal Wastewater,	W75-11012 6G
DURRANCE, R. E.	W75-11243 5B	
The Awareness of the Relevant Water		FERTL, W. H.
Resources Literature by the Personnel of the	ERICSON, D. W.	How Downhole Temperatures, Pressures Af-
Wisconsin Department of Natural Resources,	Water Resources of the Snake River	fect Drilling; Part 4: Pitfalls in Overpressure
W75-10899 10C	Watershed, East-Central Minnesota,	Prediction,
	W75-10946 7C	W75-11294 8G
DUTKA, B. J.		
Microbiological Examination of Offshore Lake	ERICSSON, B.	How Downhole Temperatures, Pressures Af-
Erie Sediments,	Nitrogen Removal in a Pilot Plant,	fect Drilling; Part 5: Predicting Hydrocarbon
W75-11218 5C	W75-10984 5D	Environments with Wireline Data,
W75-11216	W75-10964 3D	W75-11295 8G
EADY, F.	EVANS, R. L.	
		How Downhole Temperatures, Pressures Af-
The Aquatic Weed Problem. 1. Identification,	Concentration and Genera of Algae in Selected	fect Drilling; Part 6: Correlating Geopressure
W75-11220 21	Illinois Streams, 1971-1973,	Gradients with Hydrocarbon Accumulations,
PROPINOPER I	W75-11165 5A	W75-11296 8G
EDGEWORTH, L.	W. 200 W. 7	117-11270
Role and Responsibilities of the Environmental	FABLE, W. A.	How Downhole Temperatures, Pressures Af-
Protection Service (Canada),	A Survey of Fishes and Commercial Inver-	fect Drilling; Part 7: The Shale Resistivity Ratio
W75-11000 6G	tebrates of the Nearshore and Estuarine Zone	
	Between Cape Romano and Cape Sable,	- A Valuable Tool for Making Economic
EDMOND, C. E.	Florida.	Drilling Decisions,
Use of Amendments to Reduce Water Require-	W75-11189 21	W75-11297 8G
ments for Stand Establishment of Small-Seeded	1110	H. D. I. T. D. M.
Crops,	FAIR, S. S.	How Downhole Temperatures, Pressures Af-
W75-11045 3F	Beach Erosion Control Structure,	fect Drilling; Part 8: Needless Spending of
3F		Drilling and Exploration Money Can Be Pre-
EICHELSDOERFER, D.	W75-11075 8A	dicted-And Prevented,
	PATRICATION D W	W75-11298 8G
Treatment Methods of Groundwater Containing	FAIRBAIRN, P. W.	
a Large Quantity of Humic Acid	Environmental Impact Evaluation in Fresh-	How to Find Transition Zones in Soft Forma-
(Aufbereitungsversuche an einem stark humin-	water Impoundments by Vegetation Analysis of	tions,
stoffbelasteten Tiefengrundwasser),	the Terrestrial Ecosystem,	W75-11285 8G
W75-11117 5D	W75-10905 21	
		FFOLLIOTT, P. F.
EISENBERG, E. S.	FALK, M. R.	An Assessment of Snowpack Depletion-Sur-
Epifaunal Invertebrates as Indicators of Water	Acute Toxicity of Petrochemical Drilling Fluids	face Runoff Relationships on Forested
Quality in Southern Lake Pontchartain,	Components and Wastes to Fish,	Watersheds,
W75-10852 5C	W75-11265 5C	W75-11049 4A

n

21

AUTHOR INDEX

FFOLLIOTT, P. F.

Development of a Bibliographic Information	FRANK, P. A.	GERLT, J. L.
System for Water Yield Improvement Prac-	Registration of Aquatic Herbicides,	Distribution-System Operation Analysis Model,
tices,	W75-11212 4A	W75-11180 5D
W75-11050 10B	FREEMAN, T. E.	CERMON & C
FILAN, S. J.	Utilization of Phytopathogens as Biocontrols	GERMON, J-C. The Use of Soil as a Purifying System
Some Observations on Rainfall in Western		
New South Wales,	for Aquatic Weeds, W75-11206 5G	(L'Utilisation du sol Comme Systeme Epu-
W75-11304 2B	W 75-11200	rateur),
W 75-11304 2B	FRENCH, R.	W75-11126 5D
FINKEL, H.	Australian Arid Zone Streangauging,	GHILDYAL, B. P.
Human Obstacles to the Control of the	W75-11307 2E	Effect of Soil-Water Relations on the Root
Hydrological Cycle for the Benefit of Man,		Porosity, Transpiration and Ion Uptake in Rice,
W75-10866 2A	FRIEDMANN, C. T. H.	W75-10916 3F
1175 10000	A Waterborne Gastroenteritis Epidemic in Pico	W 73-10916 3F
FINLEY, H. E.	Rivers, California,	GHOSH, S.
Population Dynamics of Protozoa in Waste-	W75-11005 5F	Anaerobic Acidogenesis of Wastewater Sludge,
water,		W75-10976 5D
W75-10957 5D	FRITSCHEN, L. J.	1175-10710
	Evapotranspiration of Four Forest Types Mea-	GIESEL, J. T.
FISH, H.	sured With the Eddy Correlation Technique,	Impact of Thermal Effluent from Steam-Elec-
A New Look at Pollution Prevention on	W75-11044 2D	tric Station on a Marshland Nursery Area dur-
Lowland Rivers,	FRITZ, J. S.	ing the Hot Season,
W75-11132 5G	Chromatographic Determination of Phenols in	W75-11032 5C
STATE OF THE PARTY	Water,	
FISHBEIN, L.	W75-11344 5A	GIFFORD, G. S.
Mutagens and Potential Mutagens in the Bio-	W/5-11544 5A	Approximate Annual Water Budgets of Two
sphere: I. DDT and Its Metabolites,	FUEHRING, H. D.	Chained Pinyon-Juniper Sites,
Polychlorinated Biphenyls, Chlorodioxins,	Effects of Antitranspirants on Yield of Grain	W75-10896 4A
Polycyclic Aromatic Hydrocarbons,	Sorghum Under Limited Irrigation,	
Haloethers,	W75-10858 3F	GILBERT, E.
W75-11170 5B		Man's Impact on a Newly Formed Reservoir,
Mutagens and Potential Mutagens in the Bio-	Г ИЛМОТО, Е.	W75-11233 5C
sphere: II. MetalsMercury, Lead, Cadmium	Water Quality Control in Sewage Water Treat-	ONIONENO M II
and Tin,	ment, (In Japanese),	GINSBERG, M. H.
W75-11171 5B	W75-11133 5D	Map Showing Depth to Bedrock, Mount Car-
	FUJITA, T.	mel Quandrangle, Connecticut,
FISHER, I. H.		W75-10954 7C
Generation of Arid Zone Rainfall and Runoff,	Mercury Content of Whales, (In Japanese),	GITCHEL, W. B.
W75-11303 2A	W75-11029 5B	Carbon Regeneration by Wet Air Oxidation,
	FULLER, W. H.	W75-10988 5D
FLYNN, B. H.	Management of Southwestern Desert Soils,	W /3-10966 3D
The Law of Water Allocation in Kentucky,	W75-10877 2G	GLENN, N. L.
W75-10898 6E		Advanced Techniques in the Mathematical
	Soils of the Desert Southwest,	Modeling of Water-Distribution Systems,
FORMAN, S. E.	W75-10878 2G	W75-11183 4A
The Mechanics of Rock Failure Due to Water		11110
Jet Impingement,	GAABOUB, I. A.	GLOOSCHENKO, W. A.
W75-11272 8E	Standard Curves for Nuvacron, Malathion,	Primary Production in Lakes Ontario and Erie:
FORSBERG, A.	Sevin, DDT, and Kelthane Tested Against the	A Comparative Study,
Minitest Method for Monitoring Effluent Quali-	Mosquito Culex Pipiens L. and the	W75-11217 5C
ty,	Microcrustacean Daphnia Magna Straus,	
W75-10994 5D	W75-11082 5B	GLOVER, J. R.
11.5.10574	GANGSTAD, E. O.	Investigation of the Operating Characteristics
FORSBERG, C.	Registration of Aquatic Herbicides,	of the Iowa Sediment Concentration Measuring
Minitest Method for Monitoring Effluent Quali-	W75-11212 4A	System,
ty,		W75-11163 2J
W75-10994 5D	GANGWAR, M. S.	CONFREY B I
	Effect of Soil-Water Relations on the Root	GODFREY, P. J.
FORSELL, B.	Porosity, Transpiration and Ion Uptake in Rice,	A Computer Program Package for Aquatic Ecologists.
Lamella Sedimentation: A Compact Separation	W75-10916 3F	W75-10908 2H
Technique,		W 73-10906 2n
W75-10989 5D	GARTON, J. E.	GOLD, K.
FOSTER, J. H.	Improved Design and Operating Criteria for	The Role of Planktonic Protozoa in the Marine
Floodplain Land-Use Management: An Appli-	Rural Water Districts,	Food Chain. Seasonal Changes, Relative
cation of Operations Research Methodology,	W75-11056 6D	Abundance, and Cell Size Distribution of Tin-
W75-11037 6F	GATI, P.	tinnida,
17.5-1105/	Papermaking Complex at Dunaujvaros	W75-11191 50
FOX, J. A.	(Hungary) Preserving the Danube (Au com-	The standard and the
Some Results on Mass Transfer Processes in a	plexe papetier de Dunaujvaros preserver le	GOULD, B. W.
Density-Stratified Flow,	Danube),	Problems of Liquid Waste Disposal,
W75-11057 8B	W75-11333 5D	W75-11112 50
FRANK, F. J.	GEISTERT, W.	GRABOW, W. O. K.
Ground Water in the Corvallis-Albany Area,	System for Optimal Pressure Control in a	Drug Resistant Coliforms Call for Re-Evalua
Central Willamette Valley, Oregon,	Multi-Stage Evaporation Unit,	tion of Water Quality Standards,
W75-10940 2F	W75-11070 3A	W75-11130 51

GRADY, C. P. L. Temperature Effects on Microbial Growth in	HALL, J. R. A Survey of Fishes and Commercial Inver-	HAUBOLD, R. G. Approximation for Steady Interface Beneath a
CSTR's, W75-10968 5D	tebrates of the Nearshore and Estuarine Zone	Well Pumping Fresh Water Overlying Salt Water,
	Between Cape Romano and Cape Sable, Florida,	W75-11255 4B
GRAFFIN, P. Limitations of Using a Simulation Model of the	W75-11189 2I	HAUSHILD, W. L.
Soil Under Irrigated Cultivation to Simulate the	HALLIDAY, J.	Use of Productivity of Periphyton to Estimate
Functioning of the Soil as a Purifying System (Limites D'Utilisation D'Un Modele de Com-	Adjudicating Tenders for Aeration Devices:	Water Quality,
portement du sol sous Culture Irriguee Pour	Best Value and Reliability, W75-10972 5D	W75-10936 5B
Simuler le Fonctionnment du sol Comme	W75-10972 5D	HAVENS, J. S.
Systeme Epurateur), W75-11125 5B	HANDMAN, E. H.	An Appraisal of Potential Water Salvage in the Lake McMillen Delta Area, Eddy County, New
The state of the s	Contour Map of the Bedrock Surface, New Britain Quadrangle, Connecticut,	Mexico,
The Use of Soil as a Purifying System (L'Utilisation du sol Comme Systeme Epurateur),	W75-10950 7C	W75-10941 3B
W75-11126 5D	Map Showing Depth to Bedrock, Mount Car- mel Quandrangle, Connecticut,	HEDSTROEM, B. Lamella Sedimentation: A Compact Separation Technique,
GREEN, R. L.	W75-10954 7C	W75-10989 5D
Considerations for Preparation of Operation and Maintenance Manuals,	HANF, E. N.	HEIDBBERED C A
W75-11317 5D	Upgrading Metal-Finishing Facilities to Reduce Pollution. (Part 1). In-Process Pollution Abate-	HEIDBREDER, G. A. A Waterborne Gastroenteritis Epidemic in Pico
GREIG, I. R. M.	ment,	Rivers, California, W75-11005 5F
Aeration Devices: The Manufacturer's View- point,	W75-11324 5D	
W75-11121 . 5D	HANKS, A. R.	HEIP, C. A Note on Salinity and Temperature in Some
GRITZ, R. L.	Biomagnification of Dieldrin Residues by Food	Moroccan Brackish Waters,
Effects of Some Components of Crude Oil on	Chain Transfer from Clams to Blue Crabs Under Controllled Conditions,	W75-10997 2L
Young Coho Salmon, W75-11088 5C	W75-11135 5C	HELGESEN, J. O.
	HANSHAW, B. B.	Water Resources of the Lower St. Croix River
GROTE, J. O. Apparatus for Concentration of Volatile Or-	Determination of Regional Hydraulic Conduc-	Watershed, East-Central Minnesota, W75-10945 7C
ganic Pollutants in Water,	tivity Through Use of C-14 Dating of Ground-	
W75-11342 5A	water, W75-10930 2F	Water Resources of the Snake River Watershed, East-Central Minnesota,
GUERRA, L. V.		W75-10946 7C
Integrated Controls on Noxious Aquatic Plants,	HANSMANN, E. W. Man's Impact on a Newly Formed Reservoir,	HELZ, G. R.
W75-11204 5G	W75-11233 5C	Behavior of Mn, Fe, Cu, Zn, Cd and Pb
GUNTHER, F. J.	HARANG, D.	Discharged from a Wastewater Treatment Plant into an Estuarine Environment,
Computer Systems and Water Resources, W75-11174 6A	The Louisiana Environmental Management	W75-11160 5B
GUPTA, V. L.	System and Its Utility in Water Resource	HERGERT, G. W.
Time-Variant Characteristics of Selected	Planning, W75-11177 5G	Some Observations Concerning Preparation
Wastewater Treatment Plants of Nevada, W75-11245 5D		and Storage of Stream Samples for Dissolved Inorganic Phosphate Analysis,
	HARDY, C. D. Surface Tension Reductions and Urban Wastes	W75-11336 5A
HAAS, C. A. Upgrading Meat Packing Facilities to Reduce	in The New York Bight,	HERGERT, S. L.
Pollution. (Part 2). Waste Treatment,	W75-10927 5B	Upgrading Meat Packing Facilities to Reduce
W75-11321 5D	HARLEMAN, D. R. F.	Pollution. (Part 2). Waste Treatment,
HADDIX, G. F.	Experimental Study of the Cooling Water	W75-11321 5D
Distribution-System Operation Analysis Model, W75-11180 5D	System, Setubal Power Plant, Rio Sado, Portu- gal,	HETLING, L. J.
	W75-10855 5B	Nitrogen Removal by Catalyst-Aided Break- point Chlorination,
HAGAN, R. M. Successful Irrigation: Preparation, Realization,	HARP, J. F.	W75-10965 SE
Exploritation, (Savoir Irriguer: Preparation,	Deprivation Contribution and Interference Ef-	HICKMAN, M.
Realisation, Exploitation),	fects of Multiple Wells in a Common Aquifer,	The Growth of Some Epiphytic Algae in a Lake
W75-10874 3F	W75-11142 4B	Receiving Thermal Effluent,
HAGSTROM, B. E.	HARPE, T.	W75-11225
The Effects of Crude Oils and the Dispersant Corexit 8666 on Sea Urchin Gametes and Emb-	Treatment Methods of Groundwater Containing a Large Quantity of Humic Acid	HIKICHI, M. Studies on the Pelationship Retween Dry
ryos,	(Aufbereitungsversuche an einem stark humin-	Studies on the Relationship Between Dry Matter Production and the Development of a
	stoffbelasteten Tiefengrundwasser), W75-11117 5D	Pine Forest on Coastal Sand Dunes (1), (In Japanese).
The Effects of Oil Dispersants on the Cell in Fertilization and Development,		Japanese), W75-11098 4A
W75-11091 5C	HART, F. L. Measures of Biodegradability and Refractory	
HALL, I. R.	Organics in Wastewaters: (Analysis, Interpreta-	HILL, J. M. Behavior of Mn, Fe, Cu, Zn, Cd and Pl
Some Studies on Nitrification in the Activated	tion, and Application of Measurement	Discharged from a Wastewater Treatment Plan
Sludge Process, W75-10961 5D	Techniques), W75-11103 5D	into an Estuarine Environment, W75-11160 51
W75-10961 5D	11.5-11105 3D	

,

.

0

C

2

0

A

c

s

ic H

ne ne n-

C

G

В

AUTHOR INDEX

	AUTHOR INDEX
HILSON, M. A.	
HILSON, M. A.	HUDSON, J. C.
Water Treatment for Public Supply,	Aquatic Plant Research and Control in Florida,
W75-11119 5F	W75-11195 4A
HIRASAKI, G. J.	HUGGETT, R. J.
Analysis of Factors Influencing Mobility and	Behavior of Mn, Fe, Cu, Zn, Cd and Pb
Adsorption in the Flow of Polymer Solution	Discharged from a Wastewater Treatment Plant
Through Porous Media,	into an Estuarine Environment,
W75-11275 8B	W75-11160 5B
HIRON, R. W. P.	HUMISTON, G. F.
The Role of Endogenous Abscisic Acid in the	Low Temperature Water Purification System,
Response of Plants to Stress,	W75-11074 5F
W75-11319 3F	J.
HIRONO, S.	HUMMEL, R. J.
Uranium Mineralization by Ground Water in	Registration of Herbicides for Aquatic Use,
Sedimentary Rocks, Japan.	W75-11197 5G
W75-11145 2F	Walnus a a
20	HUMPHREY, R. R.
HOLBO, H. R.	Phenology of Selected Sonoran Desert Plants at
Evapotranspiration of Four Forest Types Mea-	Punta Cirio, Sonora, Mexico.
sured With the Eddy Correlation Technique,	W75-10862
W75-11044 2D	HUNTER, W. G.
HONECCED D I	Treatment Plant Monitoring Programs: A
HONEGGER, R. J. Vacuum Distillation/Vapor Filtration Water	Preliminary Analysis,
Recovery,	W75-11176 5D
W75-11315 5D	
35	HURST, W. S.
HOPFENBERG, H. B.	Note on the Measurement of the Response of
Solute-Solute Interactions in Ultrafiltration	Oceanographic Temperature Sensors,
Treatment of Paper Mill Wastes,	W75-11146 7E
W75-11334 5D	HWANG, C. L.
HOPPE, A.	Design of the Optimal Outfall System for a
System for Optimal Pressure Control in a	Stream Receiving Thermal and Organic Waste
Multi-Stage Evaporation Unit,	Discharges,
W75-11070 3A	W75-11137 5B
HORNKE, R.	HYDE, R. M.
Measures in the Sulfite Pulp Industry for	Guidelines for Revegetation and Stabilization
Decreasing Waste Water Load (Massnahmen	of Surface Mined Areas in the Western States.
der Sulfitzellstoff-Industrie zur Minderung der	W75-11100 4D
Abwasserbelastung),	-
W75-11339 5D	HYDEN, J. W.
	Simulation of Water Quality Management Poli-
HORWITZ, L. B.	cies,
Macroscopic Distribution-System Modeling,	W75-11181 5G
W75-11185 4A	HYNES, H. B. N.
HOUSTON, C. E.	The Effects of Experimental Blackfly (Diptera
Successful Irrigation: Preparation, Realization,	Simuliidae) Larviciding with Abate, Dursban
Exploritation, (Savoir Irriguer: Preparation,	and Methoxychlor on Stream Invertebrates,
Realisation, Exploitation),	W75-11157 50
W75-10874 3F	
HOWARD, T. E.	INABA, D.
Effluent Characteristics and Treatment of	Some Observations on Behavior of the Treated
Mechanical Pulping Effluents,	Sewage Disposed in the Sea,
W75-11331 5D	W75-11020 5E

HIRASAKI, G. J.	HUGGETT, R. J.
Analysis of Factors Influencing Mobility and	Behavior of Mn, Fe, Cu, Zn, Cd and Pb
Adsorption in the Flow of Polymer Solution	Discharged from a Wastewater Treatment Plant
Through Porous Media,	into an Estuarine Environment,
W75-11275 8B	W75-11160 5B
WIDON D. W. D.	
HIRON, R. W. P.	HUMISTON, G. F.
The Role of Endogenous Abscisic Acid in the	Low Temperature Water Purification System,
Response of Plants to Stress,	W75-11074 5F
W75-11319 3F	,
	HUMMEL, R. J.
HIRONO, S.	Registration of Herbicides for Aquatic Use,
Uranium Mineralization by Ground Water in	W75-11197 5G
Sedimentary Rocks, Japan.	111311131
W75-11145 2F	HUMPHREY, R. R.
	Phenology of Selected Sonoran Desert Plants at
HOLBO, H. R.	Punta Cirio, Sonora, Mexico.
Evapotranspiration of Four Forest Types Mea-	
sured With the Eddy Correlation Technique,	W75-10862 2I
W75-11044 2D	HUNTER, W. G.
HONEGGER, R. J.	Treatment Plant Monitoring Programs: A
Vacuum Distillation/Vapor Filtration Water	Preliminary Analysis,
Recovery,	W75-11176 5D
W75-11315 5D	HUDOT W C
	HURST, W. S.
HOPFENBERG, H. B.	Note on the Measurement of the Response of
Solute-Solute Interactions in Ultrafiltration	Oceanographic Temperature Sensors,
Treatment of Paper Mill Wastes,	W75-11146 7B
W75-11334 5D	Constitution of the second of
	HWANG, C. L.
HOPPE, A.	Design of the Optimal Outfall System for a
System for Optimal Pressure Control in a	Stream Receiving Thermal and Organic Waste
Multi-Stage Evaporation Unit,	Discharges,
W75-11070 3A	W75-11137 5B
HORNKE, R.	HYDE, R. M.
Measures in the Sulfite Pulp Industry for	Guidelines for Revegetation and Stabilization
Decreasing Waste Water Load (Massnahmen	of Surface Mined Areas in the Western States,
der Sulfitzellstoff-Industrie zur Minderung der	W75-11100 4D
Abwasserbelastung),	
W75-11339 5D	HYDEN, J. W.
20	Simulation of Water Quality Management Poli-
HORWITZ, L. B.	cies,
Macroscopic Distribution-System Modeling,	W75-11181 5G
W75-11185 4A	30
	HYNES, H. B. N.
HOUSTON, C. E.	The Effects of Experimental Blackfly (Diptera:
Successful Irrigation: Preparation, Realization,	Simuliidae) Larviciding with Abate, Dursban,
Exploritation, (Savoir Irriguer: Preparation,	and Methoxychlor on Stream Invertebrates,
Realisation, Exploitation),	W75-11157 5C
W75-10874 3F	11/5/11/5/
•	INABA, D.
HOWARD, T. E.	Some Observations on Behavior of the Treated
Effluent Characteristics and Treatment of	Sewage Disposed in the Sea,
Mechanical Pulping Effluents,	W75-11020 5B
W75-11331 5D	#75*11020 3B
	INOUE, M.
Mill Experience in the Treatment of Mechani-	Practical Application of Surface Fixed-System
cal Pulping Effluent,	
W75-11332 5D	for Multi-Purpose Sprinkler Irrigation Uses, (In
	Japanese),
HOWE, C. W.	W75-11097 3F
An Economic Analysis of the Pollution	ISGARD, E.
Problems in the Colorado River Basin: The	Underground Wastewater Treatment Plants,
Upper Main Stem Sub-Basin,	
W75-11247 5G	W75-10974 5D
	ISHIGURO, M.
HOY, E. D.	A Planning of Catchment Sewerage for Oyodo
The Measurement and Estimation of Lake	
Evaporation from Four Australian Water	River (In Japanese),
Storages,	W75-11113 5D
W75-11300 2D	TOTAL TO
	ISHIHARA, T. S.
	Studies on Toxicity of Sodium Nifurstyrenate
Seasonal Abundance and Diversity of Benthos	(NFS-NA) in Cultured Yellowtail (In
HUBERT, W. A. Seasonal Abundance and Diversity of Benthos in a Southern Illinois, USA Swamp, W75-11312 2H	(NFS-NA) in Cultured Yellowtail (In Japanese), W75-11034 5C

	ISHIHARA, Y.	
	Device for Automatic Determination	of
	Suspended Solids Content in Water, W75-11063	5A
		344
	JACKSON, F. H. Mobile Unit for Treating Liquid Waste,	
	W75-11073	5D
		00
	JACKSON, I. J.	
	Aspects of Rainfall Measurement in a New gland Location,	En-
	W75-11309	2B
	ALCORGON A B	
	JACOBSON, A. R. Wastewater Treatment Using Algae and	Ar-
	temia,	
	W75-10967	5D
	JACOBY, G. C.	
	Impact of Energy Development on the Lav	v of
	the Colorado River,	
	W75-10869	4C
	JAKOBSEN, P.	
	Natural and Fertilizer Nitrogen in Streams	and
	Lakes, W75-11311	en
	W/3-11311	5B
	JANICKE, I. J.	
	Tensids (Syndets) and the Water Pollu	
	Problem, (Gesund-Heitliche Aspekte Des 7 sid-Gebrauchs),	l'en-
	W75-11134	5D
	1410D 14	
	JAWED, M. Ammonia Excretion by Zooplankton and	ite
	Significance to Primary Productivity Du	
	Summer,	
	W75-11187	5C
	JEH, S. Y.	
	Effects of Irrigation in Rain-Fed Fields on	
	Growth and Yield of Upland Rice Varieties Korean).	, (In
	W75-10853	3F
	WWW.	
	JIRKA, G. Experimental Study of the Cooling W	ater
	System, Setubal Power Plant, Rio Sado, Po	
	gal,	40
	W75-10855	5B
	JOBSON, H. E.	
	Stochastic Analysis of Particle Movement)ver
	a Dune Bed, W75-10942	2J
		23
	JOENSEN, A. H.	025
	Oil Pollution and Seabirds in Denmark 1 1968,	935-
	W75-10893	5C
	TOTALEN T N ID	
	JOHNSEN, T. N. JR. Effects of Pinyon-Juniper Removal on Na	tural
	Resource Products and Uses in Arizona,	
	W75-10886	3B
•	JOHNSON, A. H.	
	Some Observations Concerning Prepara	ation
)	and Storage of Stream Samples for Disso	lved
	Inorganic Phosphate Analysis, W75.11336	5A
•	W75-11336	JA
	JOHNSON, F. L.	
	Guidelines for the Identification of Pote	
1	Environmental Impacts in the Construction Operation of a Reservoir,	anu
	W75-11316	5C

of A

D

n-

r-D

of #C

5B

on en-

its ing

the (In

ter tu-5B

ver 2J

35-5C

ural 3B

tion lved 5A

ntial and 5C

JOHNSON, R. L.	KASHIWAGI, S.	KIRTON, M. P.
Finite-Element Method for Water-Distribution	Studies on Toxicity of Sodium Nifurstyrenate	Effects of Some Components of Crude Oil on
Networks,	(NFS-NA) in Cultured Yellowtail (In	Young Coho Salmon,
W75-11186 4A	Japanese), .	W75-11088 5C
JOHNSON, R. W.	W75-11034 5C	
Legal and Institutional Problems in the	KAWAKAMI, H.	KLARER, D. M.
Management of Salinity,	Biodegradation of Components of Pulp Waste	The Growth of Some Epiphytic Algae in a Lake
W75-11047 5G	Effluents by Bacteria. (1). Degradation of Kraft	Receiving Thermal Effluent,
	Lignin (In Japanese),	W75-11225 5C
JOHNSON, W. M.	W75-11346 5B	VI ACC D I
Considerations for Preparation of Operation		KLASS, D. L.
and Maintenance Manuals,	KAWASAKI, H.	Anaerobic Acidogenesis of Wastewater Sludge, W75-10976 5D
W75-11317 5D	Nozzle Hydraulics in the Trickle Irrigation	W75-10976 5D
IOLIEV B I	SystemRelation Between Water Temperature	KNOLL, J. R.
JOLLEY, R. L. Chlorine-Containing Organic Constituents in	and Nozzle Flow Rate (In Japanese),	Registration of Aquatic Herbicides,
Chlorinated Effluents,	W75-11096 3F	W75-11212 4A
W75-10970 5D	KEEGAN, J. F.	W/3-11212
W13-10370	Preventing Backflow in Piping Cross Connec-	KOGA, T.
JONES, L. W.	tions,	Mercury Content of Whales, (In Japanese),
Oil Separator with Coalescing Media,	W75-11018 5B	W75-11029 5B
W75-11071 5G		
	KEENEY, D. R.	колс, м.
JONES, M. E.	Concurrent Nitrification-Denitrification at the	Theory of Plasticity of Porous Media with
Differential Release of Water from Arizona	Sediment-Water Interface as a Mechanism for	Fluid Flow,
Snowpacks,	Nitrogen Losses from Lakes,	W75-11276 8E
W75-10860 2C	W75-10902 5C	
JONES, N. B.	KEMP, A. L. W.	KOOPMAN, F. C.
Algae Removal Using Dissolved Air Flotation,	Preliminary Information on the Nature of Or-	Estimated Availability of Surface and Ground
W75-10978 5D	ganic Matter in the Surface Sediments of Lakes	Water in the Pojoaque River Drainage Basin,
32	Huron, Erie, and Ontario,	Santa Fe County, New Mexico,
JONES, P. H.	W75-11240 2J	W75-10938 4A
Review of Conference on Hydrology of Deep		VACUED I E
Sedimentary Basins,	KENNEDY, E. M.	KREIDER, J. F.
W75-10935 5B	The Responsibility of U.S. Water Suppliers,	An Economic Analysis of the Pollution
JONES, R. H.	W75-10856 5G	Problems in the Colorado River Basin: The Upper Main Stem Sub-Basin,
Upgrading Poultry-Processing Facilities to	VENNERY II	
Reduce Pollution. (Part 1). In-Process Pollution	KENNEDY, J. L. 'Self-Tapping Screw' Bit Would Use Lighter	W75-11247 5G
Abatement,	Weights,	KROETZSCH, P.
W75-11328 5D	W75-11283 8C	Aeration by Means of Blast Nozzle A Possi-
	***************************************	bility for the Aeration of Biological Waste
JOSHI, L. S.	KEOKOSKY, E.	Water Treatment Plants (Die Strahlduesen-
Application of Electrical Analogy to Draw	A Computer Program Package for Aquatic	begasung-eine Moeglichkeit zur Belueftung
Flow Nets for Sudden Drawdown Conditions in	Ecologists,	biologischer Klaeranlagen),
Earth Dams,	W75-10908 2H	W75-11124 5D
W75-11143 8B	KHAN, H. M.	
KADOTA, S.	Absorption and Elimination of Photodieldrin by	KRULL, J. N.
Some Observations on Behavior of the Treated	Daphnia and Goldfish,	Seasonal Abundance and Diversity of Benthos
Sewage Disposed in the Sea,	W75-11085 5B	in a Southern Illinois, USA Swamp,
W75-11020 5B		W75-11312 2H
B1001 D10	KHAN, M. A. Q.	KU, H. F. H.
KALRA, Y. P.	Absorption and Elimination of Photodieldrin by	Streamflow in the New York Part of the
Specific Conductance Method for in Situ Esti-	Daphnia and Goldfish,	Susquehanna River Basin,
mation of Total Dissolved Solids, W75-11167 5A	W75-11085 5B	W75-10931 2E
W/3-1110/	KIDD, D. E.	41.
KAMIMURA, S.	Man's Impact on a Newly Formed Reservoir,	KUHN, A.
Mercury Contents in Biologically Preserved	W75-11233 5C	On-Site Hypochlorite Generation,
Specimens of Menuke (Sebastes Baramenuke		W75-11109 5D
and S. Flammeus),	KING, D. L.	
W75-11078 5A	Acid Strip Mine Lake Recovery,	KUO, M.
KANDA, T.	W75-11224 5C	Analysis of Colorado Precipitation,
Biodegradation of Components of Pulp Waste	Cavitation Control by Aeration of High-	W75-11040 / 2B
Effluents by Bacteria. (1). Degradation of Kraft	Velocity Jets,	KUDINADA M
Lignin (In Japanese),	W75-11152 8B	KURIHARA, M. Mercury Content of Whales, (In Japanese),
W75-11346 5B		
	KINMAN, R. N.	W75-11029 5E
KASAKURA, T.	Water and Wastewater Disinfection with	KYES, W. K.
Activated Carbon Adsorption Technique for	Ozone: A Critical Review,	City/Township Joint VentureA New Water
Third Stage Sewage Water Treatment, (In	W75-10956 5D	Plant,
Japanese), W75-11108 5D	KINOSHITA, S.	W75-11015 5F
#15-11108 3D	Studies on the Relationship Between Dry-	
KASHEF, A. I.	Matter Production and the Development of a	LAFRANCE, D. E.
Management of Retardation of Salt Water In-	Pine Forest on Coastal Sand Dunes (1), (In	Low-Flow Characteristics of Selected Streams
trusion in Coastal Aquifers,	Japanese),	in Northeastern Washington,
W75 11059	W75.11009 4A	W75-10939

LAGER, D. L.	LEGAZ, G. J.	LIU, D. L. S.
Computer Algorithms Useful for Determining a	Social Impacts of Water Resources Develop-	Microbiological Examination of Offshore Lake
Subsurface Electrical Profile Via High	ments and Their Implication for Urban and	Erie Sediments,
Frequency Probing,	Rural Development: A Post Audit Analysis of	W75-11218 5C
W75-10910 8G	the Weber Basin Project in Utah,	
LAGUROS, J. G.	W75-10854 6B	LIU, S-K.
Deprivation Contribution and Interference Ef-	TELAND H V	A Three-Dimensional Model for Estuaries and
fects of Multiple Wells in a Common Aquifer,	LELAND, H. V. Heavy Metals and Other Trace Elements,	Coastal Seas: Vol. II, Aspects of Computation,
W75-11142 4B		W75-10900 2L
	W75-10934 5B	LOCHER, F. A.
LANCY, L. E.	LENGYEL, A. L.	Investigation of the Operating Characteristics
Upgrading Metal-Finishing Facilities to Reduce	Mobile Unit for Treating Liquid Waste,	of the Iowa Sediment Concentration Measuring
Pollution. (Part 2). Waste Treatment,	W75-11073 5D	System.
W75-11325 5D		W75-11163 2J
LAND, B.	LESLIE, R. G.	
The Toxicity of Drilling Fluid Components to	Mill Experience in the Treatment of Mechani-	LOFTFIELD, R. E.
Aquatic Biological Systems, A Literature	cal Pulping Effluent,	Electrolytic Sea Water Process,
Review,	W75-11332 5D	W75-11068 3A
W75-11266 5C	LEWIS, D. S. C.	LOUBLAND
	The Effects of the Formation of Lake Kainji	LOHMANN, J.
LANGFORD, K. J.	(Nigeria) Upon the Indigenous Fish Population,	The Economy of Various Methods for De-
Detection of Change in Sequences of	W75-11223 SC	watering Sludge From Biological Purification
Hydrologic Data,		(Ueber die Wirtschaftlichkeit verschiedener
W75-11302 7C	LEWIS, R. A.	Verfahren zur Entwaesserung von biologischem Klaerschlamm),
LANTZ, P. M.	Detection of Change in Sequences of	W75-11127 SD
Calcium Sulfate Solubility in Brackish Water	Hydrologic Data,	W15-11121
Concentrates and Applications to Reverse Os-	W75-11302 7C	LOHSE, A.
mosis Processes: Polyphosphate Additives,	******	Stabilization and Reconstruction of Texas
W75-11004 5D	LIANG, H. C.	Coastal Foredunes with Vegetation,
LABORN D. C	Effect of Pressure Gradient on Wind-Waves in	W75-10887 2L
LARSEN, D. C.	a Laboratory Channel, W75-11093 8B	
Available Water-Holding Capacities of Soils in Southern Idaho,	W 75-11093	LONDQUIST, C. J.
W75-11140 2G	LIGHTSEY, G. R.	Map Showing Depth to Bedrock, Chester
W/5-11140 20	Bark as Trickling-Filter Dewatering Medium	Quadrangle, Massachusetts,
LARSON, D. K.	for Pulp and Paper Mill Sludge,	W75-10953 7C
An Analysis of the Motor-Row Conversion	W75-11241 5D	Map Showing Depth to Bedrock, Greenfield
Issue of Colorado River Float Trips,	42.12	Quadrangle, Massachusetts,
W75-10867 6B	LIN, J. D.	W75-10952 7C
LABOON T E	Effect of Pressure Gradient on Wind-Waves in	1175 10552
LARSON, T. E. Corrosion by Domestic Waters,	a Laboratory Channel, W75-11093 8B	Map Showing Depth to Bedrock, Worthington
W75-11062 5F	W/3-11093	Quadrangle, Massachusetts,
	LIN, S. D.	W75-10951 7C
LAWRENCE, M. J.	Concentration and Genera of Algae in Selected	LONGHIMA L. C.
Acute Toxicity of Petrochemical Drilling Fluids	Illinois Streams, 1971-1973,	LONGWELL, A. C.
Components and Wastes to Fish,	W75-11165 5A	Effects of Ozone-Treated Seawater on the Spawned, Fertilized, Meiotic, and Cleaving
W75-11265 5C	7 Th. C 11	Eggs of the Commercial American Oyster,
LAWRENCE, R. J.	LIN, S. H.	W75-11256 SC
Drilling Rate Affects Costs More than Bit Life,	Design of the Optimal Outfall System for a Stream Receiving Thermal and Organic Waste	
W75-11279 8C	Discharges,	LONNING, S.
	W75-11137 5B	The Effects of Crude Oils and the Dispersant
LE COMPTE, A. R. JR.		Corexit 8666 on Sea Urchin Gametes and Emb-
Aerobic Lagoon Waste Treatment System and	LINDALL, W. N.	ryos,
Method, W75-11069 5D	A Survey of Fishes and Commercial Inver-	W75-11090 5C
30	tebrates of the Nearshore and Estuarine Zone	The Effects of Oil Dispersants on the Cell in
LEE, B. K.	Between Cape Romano and Cape Sable,	Fertilization and Development,
Stochastic Analysis of Particle Movement Over	Florida, W75-11189 2I	W75-11091 5C
a Dune Bed,	W/3-11169 21	
W75-10942 2J	LINDHOLM, G. F.	LOUGH, R. G.
LEE, G. F.	Water Resources of the Lower St. Croix River	A Reevaluation of the Combined Effects of
Dissolved Gas Supersaturation and Dilution in	Watershed, East-Central Minnesota,	Temperature and Salinity on Survival and
Thermal Plumes from Steam Electric General-	W75-10945 7C	Growth of Bivalve Larvae Using Response
ing Stations,	W	Surface Techniques,
W75-11159 5B	Water Resources of the Snake River	W75-11081 50
TER T	Watershed, East-Central Minnesota, W75-10946 7C	LUEDTKE, J. R.
LEE, J. Experimental Study of the Cooling Water	175-10940 /C	The Awareness of the Relevant Water
System, Setubal Power Plant, Rio Sado, Portu-	LINDSEY, H. E. JR.	Resources Literature by the Personnel of th
gal,	Techniques for Linear Tie-Back Cementing,	Wisconsin Department of Natural Resources,
W75-10855 5B	W75-11277 8F	W75-10899 100
		FINISH WICE C
LEENDERTSE, J. J.	LIU, D.	LUNDKVIST, S.
A Three-Dimensional Model for Estuaries and	Application of the Manometric Technique in the Study of Sediment Oxygen Depletion,	Water Conservation in Sweden: III. Current Trends.
Coastal Seas: Vol. II, Aspects of Computation, W75-10900 2L	W75-11222 5C	W75-10987 50
10,00		

e C

d L

cs ng 2J

A

on oer on

5D

eas 2L

7C ield 7C . eton 7C

the ving

sant Emb-SC ell in

ts of and ponse

Water of the ces, 10C

urrent 5G

LURVEY, C. F.	MARR, B. E.	MCGEHEE, J. T.
Consolidation and Rehabilitation of Canals in	Water Resources,	Operation Clean Sweep,
Poudre Valley,	W75-11003 5G	W75-11192 5G
W75-11061 4A	MARSHALL, C. R.	MCI AUCHIN D. V.
LYTLE, R. J.	Upgrading Meat Packing Facilities to Reduce	MCLAUGHLIN, D. K. Hydraulic Modeling of Mixing Phenomena in
Computer Algorithms Useful for Determining a	Pollution. (Part 3). Choosing the Optimum	Stratified Lakes,
Subsurface Electrical Profile Via High	Financial Strategy,	W75-11043 2H
Frequency Probing,	W75-11322 5D	111311313
W75-10910 8G		MCLUSKY, D. S.
MACAGNO, E. O.	MARSHALL, W. L.	Some Effects of Copper on the Polychaete
Thermal Response of Heated Streams, Solution	Calcium Sulfate Solubility in Brackish Water Concentrates and Applications to Reverse Os-	Phyllodoce Maculata,
by the Implicit Method,	mosis Processes: Polyphosphate Additives,	W75-11136 5C
W75-10909 5B	W75-11004 5D	MCMAHON, T. A.
		Variability, Persistence and Yield of Australian
MACAULAY, H. H.	MARTIN, P. H.	Streams,
Simulation of Water Quality Management Poli-	Dissolved Gas Supersaturation and Dilution in	W75-11308 2E
cies, W75-11181 5G	Thermal Plumes from Steam Electric Generat-	
W/3-11161	ing Stations,	MCMASTER, G. M.
MACKAY, W. C.	W75-11159 5B	Available Water-Holding Capacities of Soils in
Effect of DDT and M.S. 222 on Learning a	MARTINEC, J.	Southern Idaho,
Simple Conditioned Response in Rainbow	Subsurface Flow from Snowmelt Traced by	W75-11140 2G
Trout (Salmo gairdneri),	Tritium,	MCNICHOLL B C
W75-11025 5C	W75-10921 2F	MCNICHOLL, P. G. Effect of DDT and M.S. 222 on Learning a
MACLEAN, S. A.	******	Simple Conditioned Response in Rainbow
Effects of Ozone-Treated Seawater on the	MASQATI, M. S.	Trout (Salmo gairdneri),
Spawned, Fertilized, Meiotic, and Cleaving	A Mathematical Model for Optimal Waste Load Allocations,	W75-11025 5C
Eggs of the Commercial American Oyster,	W75-11102 5G	
W75-11256 5C	W 75-11102	MEDINA TORRES, J. G.
	MATALAS, N. C.	Seasonal Variations in the Infiltration Rate of a
MACNISH, R. D.	Relative Importance of Decision Variables in	Whitehouse Soil in Southern Arizona,
Streamflow in the New York Part of the	Flood Frequency Analysis,	W75-10873 2G
Susquehanna River Basin, W75-10931 2E	W75-10929 4A	MEHRLE, P. M.
W75-10931 2E	MATEI, S.	Toxaphene Effects on Growth and Bone Com-
MACON, J. A.	Endemic Nephrophathy and Its Relation to the	position of Fathead Minnows, Pimephales
Upgrading Poultry-Processing Facilities to	Contamination of Well Water by Phenolic	Promelas,
Reduce Pollution. (Part 1). In-Process Pollution	Compounds in Barsa-Arad (Nefropatia En-	W75-11026 5C
Abatement,	demica Si Relatia Cu Impurificarea Prin Com-	
W75-11328 5D	pousi Fenolici in Apele Fintinilor Din Comuna	MEI, C. C.
MADSEN, G. E.	Barsa-Arad),	Effects of Entrance Loss on Harbor Oscilla-
Social Impacts of Water Resources Develop-	W75-11105 - 5B	tions, W75-11147 8B
ments and Their Implication for Urban and	MATHIS, B. J.	W/3-1114/
Rural Development: A Post Audit Analysis of	Species Diversity of Benthic Macroin-Ver-	MEIDL, J. A.
the Weber Basin Project in Utah,	tebrates and Limnological Conditions in a 1st	Carbon Regeneration by Wet Air Oxidation,
W75-10854 6B	Order Mountain Stream,	W75-10988 5D
MADSEN, R. L.	W75-10918 2I	
The Influence of Rainfall on the Reproduction	MATTSON, M. E.	MERKLE, M. G.
of Sonoran Desert Lagomorphs,	Membrane Desalting Gets Big Push,	Occurrence of 2, 4, 5-T and Picloram in Sur- face Runoff Water in the Blacklands of Texas,
W75-10871 · 4A	W75-10982 3A	W75-10895 5B
M. HONEY 1 P		11/3/10030
MAHONEY, L. E. A Waterborne Gastroenteritis Epidemic in Pico	MAYER, F. L. JR.	MEYER, R. L.
Rivers, California,	Toxaphene Effects on Growth and Bone Com-	Biochrome Analysis as a Method for Assessing
W75-11005 5F	position of Fathead Minnows, Pimephales Promelas,	Phytoplankton Dynamics, Phase II,
	W75-11026 5C	W75-11052 5C
MARAIS, G. V. R.	***************************************	MIDDLEBROOKS, E. J.
Aeration Devices: Basic Theory,	MCCOLL, W. D.	Algae Removal Using Dissolved Air Flotation,
W75-10971 5D	The Utilization of Sun-Glint in a Study of Lake	W75-10978 5D
MARCUS, B. A.	Dynamics,	
A Simple and Inexpensive Technique for	W75-11239 5A	Opulium values for Operational variables in
Determining Colored Light Intensity Un-	MCCORQUODALE, J. A.	Turbidity Removal,
derwater,	Wave Motion in Rockfill,	W75-11110 51
W75-10919 7B	W75-10924 8D	MIDDLETON, R. C.
MARIC, C.	MCCUEN D H	Electrical Tests for Submersible Pumps,
Papermaking Complex at Dunaujvaros	MCCUEN, R. H.	W75-11260 80
(Hungary) - Preserving the Danube (Au com-	Flood Runoff from Urban Areas, W75-10904 5B	
plexe papetier de Dunaujvaros preserver le	11.75-10204	MILLER, A. G.
Danube),	MCDOLE, R. E.	An Investigation of Glycolate Excretion in Two
W75-11333 5D	Available Water-Holding Capacities of Soils in	
Manuer n u	Southern Idaho,	W75-11230 50
MARINER, R. H.	W75-11140 2G	MILLER, W. A. JR.
The Minor and Trace Elements, Gas, and Isotope Compositions of the Principal Hot	MCELROY, A. D.	Laboratory Investigation of One-Dimensions
Springs of Nevada and Oregon,	Water Pollution from Nonpoint Sources,	Wave Motion in Open Channels,
W75-10937 2K	W75-11158 5B	

1411 1 101 C 1	MODERNIER C. II	NAME A TRACK OF
MILLION, C. L.	MORTIMER, C. H.	NAKAJIMA, S.
Conoco Technology Curbs Production Pollu-	Investigation of the Influence of Thermal	Improved Design of Distribution Networks by
tion,	Discharge from a Large Electric Power Station	Minimum Route,
W75-11267 5G	on the Temperature and Near-Shore Circula-	W75-11175 4A
MIRONOV, O. G.	tion of Lake Michigan,	NAVAMUDA V
Influence of Oil on Nucleic Acids of Algae,	W75-11190 5C	NAKAMURA, K.
W75-11080 5C	MORTIMER C H	A Field Study of Physico-Chemical States of
1175 11000	MORTIMER, G. H.	Artificial Radionuclides in Seawater,
Influence of Oil on Nucleic Acids of Algae,	Could The Sea be Used to Store Water for	W75-11022 5E
W75-11232 . 5C	SupplyA Possible Scheme,	NAWATO T
	W75-11129 4A	NAKATO, T.
MISRA, A. P.	MOVILLM D. I	Investigation of the Operating Characteristics
Application of Electrical Analogy to Draw	MOXHAM, R. L.	of the Iowa Sediment Concentration Measuring
Flow Nets for Sudden Drawdown Conditions in	Geochemical Reconaissance of Surficial	System,
Earth Dams,	Materials in the Vicinity of Shawangunk Moun-	W75-11163 2.
W75-11143 8B	tain, New York,	NAKAYAMA, N.
MITCHELL, A. L. JR.	W75-10928 5A	Device for Automatic Determination of
Wind Effects on Chemical Films for Evapora-	MUCK, R. E.	
tion Suppression at Lake Hefner,	Temperature Effects on Microbial Growth in	Suspended Solids Content in Water, W75-11063
W75-10920 3B		W75-11063 SA
W 75-10920 3B	CSTR's,	NANCOLLAS, G. H.
MIYAHARA, S.	W75-10968 5D	
Studies on the Inorganic Components of	MULINO, M. A.	The Kinetics of Crystallization of Scale-Form
Marine Animals-III, on the Contents of Cadmi-		ing Minerals,
um, Zinc, Copper, Lead and Iron in Muscle	Epifaunal Invertebrates as Indicators of Water	W75-11273 80
and Viscera of Marine Animals Captured in the	Quality in Southern Lake Pontchartain,	NADAVAN I V
West Sea Area of Kyushu, (In Japanese),	W75-10852 5C	NARAYAN, L. V.
W75-11087 5C	MUNAWAR, M.	Biological Control: Isolation and Bacterial Ox
		idation of the Taste-and-Odor Compound
MIYAMOTO, S.	Primary Production in Lakes Ontario and Erie:	Geosmin,
Salt and Specific Ion Effects on Germination of	A Comparative Study,	W75-11013 51
Four Grasses,	W75-11217 . 5C	NADVIC N
W75-10894 2K	MURASE, T,	NARKIS, N.
	Slurry Deliquoring by Expression,	The Mechanism of Flocculation Processes in
MOLENAAR, D.		the Presence of Humic Stubtances,
The Hydrologic CycleAs Applicable to the	W75-10969 5D	W75-10958 5I
Pacific Northwest,	MUROOKA, H.	NACCED M C
W75-10949 7C		NASSER, M. S.
MONDOHINE T. C.	Some Observations on Behavior of the Treated	Wave Motion in Rockfill,
MONDSHINE, T. C.	Sewage Disposed in the Sea,	W75-10924 8E
Tests Show Potassium Mud Versatility,	W75-11020 5B	.m.,
W75-11284 8G	MURRAY, R. A.	NEAL, G.
MOORE, J. E.		Formulation of Boundary Conditions at the
Primary Production in Lakes Ontario and Erie:	A Waterborne Gastroenteritis Epidemic in Pico	Surface of a Porous Medium,
A Comparative Study,	Rivers, California,	W75-11269 8F
W75-11217 5C	W75-11005 5F	NEW CONT. T. IV
Wishtell	MUSICK, H. B.	NEBGEN, J. W.
MOORE, P. L.	Barrenness of Desert Pavement in Yuma Coun-	Water Pollution from Nonpoint Sources,
Casing-Seat Testing - Why and How,		W75-11158 SE
W75-11291 8F	ty, Arizona, W75-10868 2G	NEW EV A B
	W75-10868 2G	NEELEY, A. B.
MORETTI, P. M.	MUSTATA, N.	Chemical-Biological Treatment With Biologica
Hydraulic Modeling of Mixing Phenomena in		Filters,
Stratified Lakes,	Endemic Nephrophathy and Its Relation to the Contamination of Well Water by Phenolic	W75-11123 SI
W75-11043 2H		NET CON C
MORIARTY, C. M.	Compounds in Barsa-Arad (Nefropatia En-	NELSON, S.
Quantitative Estimation of the Daily Ingestion	demica Si Relatia Cu Impurificarea Prin Com-	A Solution to Pump Stoppages,
of Phytoplankton by Tilapia Nilotica and	pousi Fenolici in Apele Fintinilor Din Comuna	W75-11111 80
	Barsa-Arad),	NELSON W F
Haplochromis Nigripinnis in Lake George,	W75-11105 5B	NELSON, W. E.
Uganda, W75-11268 2H	MVDEEN P	Solid Wastes, Animal Refuse, and Organic
W 13-11200 2H	MYREEN, B.	Residues Disposal, and the Quality of Ground
MORIARTY, D. W. J.	Treating Effluents from a Sulphite Pulp Mill by	Water,
Quantitative Estimation of the Daily Ingestion	Flotation,	W75-11244 5F
of Phytoplankton by Tilapia Nilotica and	W75-11347 5D	NEMATI, N.
Haplochromis Nigripinnis in Lake George,	NADED W	
Uganda,	NADER, W.	Shrub Transplanting for Watershed Manage
W75-11268 2H	Formulation of Boundary Conditions at the	ment and Range Improvement in Iran,
	Surface of a Porous Medium,	W75-10870 4I
MORRIS, A. W.	W75-11269 8B	NEUDORF, S.
The Accumulation of Cadmium, Copper, Man-	NAGAKURA, K.	Absorption and Elimination of Photodieldrin by
ganese and Zinc by Fucus Vesiculosus in the		
Bristol Channel,	Mercury Content of Whales, (In Japanese),	Daphnia and Goldfish,
W75-11083 . 5B	W75-11029 5B	W75-11085 51
	NACAVA V	NEUFELD B D
MORROW, J. E.	NAGAYA, Y.	NEUFELD, R. D. Wastewater Treatment Plant Odors: A Continu
Effects of Some Components of Crude Oil on	A Field Study of Physico-Chemical States of	
Young Coho Salmon,	Artificial Radionuclides in Seawater,	ing Enigma, W75-10986
W75-11088 5C	W75-11022 5B	W75-10986 51

A of B

cs ng 2J

of A

m-BG

nd 5F

in 5D

8D

the 8B

5B ical 5D

8C

anic and 5B

age-

n by 5B

tinu-

NEVERIL, R. B.	UDA, K.	PASHLEY, A. E.
Vacuum Distillation/Vapor Filtration Water	Water Treatment by Ozone, (In Japanese),	In Situ Measurement of the Settling Velocity
Recovery,	W75-11107 5D	Profile of Particulate Organic Carbon in Lake
W75-11315 5D		Ontario,
NICHOLS, T. M.	OGASAWARA, R.	W75-11227 5C
How to Estimate and Escalate Costs of Waste-	Studies on the Relationship Between Dry-	DATAMETAD II M
water Equipment,	Matter Production and the Development of a	PATANKAR, U. M.
	Pine Forest on Coastal Sand Dunes (1), (In	Upgrading Meat Packing Facilities to Reduce
W75-11014 5D	Japanese),	Pollution. (Part 3). Choosing the Optimum
NICHOLSON, S. A.	W75-11098 4A	Financial Strategy,
Root:Shoot and Leaf Area Relationships of		W75-11322 5D
Macrophyte Communities in Chautauqua Lake,	OGG, C. W.	BATTON C.C.
New York,	Acid Strip Mine Lake Recovery,	PATTON, C. C.
	W75-11224 5C	Dissolved Gases Are Key Corrosion Culprits,
W75-11009 5C		W75-11274 8G
NILSSON, L.	OKADA, Y.	DATE OF
Industry and Community in Cooperation,	Advanced Wastewater Treatment (In	PAUL, S. K.
W75-10985 5D	Japanese),	Electrolytic Control of Algae,
W15-10705	W75-11114 5D	W75-11228 5F
NISSEN, J. A.		DEADCE D
Preserving Activated Sludge,	OLSEN, A. E.	PEARCE, D.
W75-10962 5D	Upgrading Metal-Finishing Facilities to Reduce	Non-Renewable, Non-Energy Resources,
	Pollution. (Part 1). In-Process Pollution Abate-	W75-11253 6B
NOMURA, Y.	ment,	DEDDY D F
Practical Application of Surface Fixed-System	W75-11324 5D	PERRY, P. F.
for Multi-Purpose Sprinkler Irrigation Uses, (In		Hierarchial Model for Water-Supply-System
Japanese),	OPACIC, D. J.	Control,
W75-11097 3F	Mobile Unit for Treating Liquid Waste,	W75-10996 . 4A
31	W75-11073 5D	PETROCELLI, S. R.
NORRIS, L. E.		Biomagnification of Dieldrin Residues by Food
Dissipation of Residues of Phenoxy Herbicides	ORR, H. K.	
Applied to the Watershed,	Watershed Management in the Black Hills: The	Chain Transfer from Clams to Blue Crabs
W75-11213 5B	Status of Our Knowledge,	Under Controllled Conditions,
	W75-11318 4D	W75-11135 5C
NORRMAN, G.		PFANNKUCH, H. O.
Treating Effluents from a Sulphite Pulp Mill by	OSEID, D. M.	Study of Criteria and Models Establishing Op-
Flotation,	Factors Influencing Acute Toxicity Estimates	timum Level of Hydrogeologic Information for
W75-11347 5D	of Hydrogen Sulfide to Freshwater Inver-	Groundwater Basin Management,
	tebrates,	W75-11042 2F
NOVOSAD, C. J.	W75-11027 5C	W75-11042
Aquatic Plant Control on Lake Corpus Christi,		PHILLIPS, C. N. K.
W75-11194 5G	OSTROFF, A. G.	Some Effects of Copper on the Polychaete
NOW . OF W	Subsurface Water Tool for Petroleum Ex-	Phyllodoce Maculata,
NOWACKI, H.	ploration,	W75-11136 5C
Economics of Great Lakes Shipping in an Ex-	W75-11289 4B	W75-11150 SC
tended Season,		PILGRIM, D. H.
W75-11248 6C	PAGE, G. L. JR.	Difficulties in Gauging Small Catchments - A
NOZAKI, Y.	Considerations for Preparation of Operation	Case Study,
Studies on the Inorganic Components of	and Maintenance Manuals,	W75-11306 2E
Marine Animals-III, on the Contents of Cadmi-	W75-11317 5D	
um, Zinc, Copper, Lead and Iron in Muscle		PILKINGTON, P. E.
	PAILY, P. P.	How to Find Transition Zones in Soft Forma-
and Viscera of Marine Animals Captured in the	Thermal Response of Heated Streams, Solution	tions,
West Sea Area of Kyushu, (In Japanese),	by the Implicit Method,	W75-11285 8G
W75-11087 5C	W75-10909 5B	
NUNEZ, W. J.		PILLSBURY, A. F.
Biological Control: Isolation and Bacterial Ox-	PALMER, J. D.	Sprinkler Irrigation Practice, (La Pratique De
idation of the Taste-and-Odor Compound	How to Conduct Corrosion Tests,	L'Irrigation Par Aspersion),
Geosmin,	W75-11292 8G	W75-10875 3F
W75-11013 5F		
35	PANZER, H. P.	PIONKE, H. G.
NUTTER, W. L.	Process for Raw Water Clarification,	Extraction and Analytical Techniques for Pesti-
Moisture and Energy Conditions in a Draining	W75-11072 5F	cides in Soil, Sediment, and Water,
Soil Mass,		W75-11236 5A
W75-11054 2G	Process for Treating Industrial Wastes,	POPLE C I M
	W75-11066 5D	POELS, C. L. M.
O'CONNELL, P. F.	December 1 to 1 t	Continuous Automatic Monitoring of Surface
Effects of Pinyon-Juniper Removal on Natural	Process for Treating Industrial Wastes,	Water with Fish,
Resource Products and Uses in Arizona,	W75-11067 5D	W75-11079 5A
W75-10886 3B	Process for Treating Commer Chadas	DOIDBIED M A
	Process for Treating Sewage Sludge, W75-11064 5D	POIRRIER, M. A.
O'SULLIVAN, D. A.	W75-11064 5D	Epifaunal Invertebrates as Indicators of Water Quality in Southern Lake Pontchartain,
Innovative Process Treats Wastewater,	PARTINGTON, G. L.	
W75-10975 5D	Interference of Sulfate Ion on SPADNS	W75-10852 5C
OPST C E	(Sodium 2-(Sulfophenylazo)-1,8-Dihydrox-	POON, C. P. C.
OBST, C. E. Horizontal Groundwater Collectors 'Canada's	vnaphthalene-3.6-Disulfonate) Colorimetric	Physiochemical Treatment of Wastewater-Sea-
Horizontal Groundwater Collectors, 'Canada's	Determination of Fluorine in Waste Waters,	water Mixture by Electrolysis,
Largest Water Well', W75-10999 8B	W75-11343 5A	W75-10979 5D
11 13-10333 8B		30

POPE, G. A. Analysis of Factors Influencing Mobility and	REDDY, M. M. The Kinetics of Crystallization of Scale-Form-	ROGERS, J. S. Epifaunal Invertebrates as Indicators of Water
Adsorption in the Flow of Polymer Solution	ing Minerals,	Quality in Southern Lake Pontchartain,
Through Porous Media, W75-11275 8B	W75-11273 8G	W75-10852 5C
W75-11275 8B	REILAND, L. J.	ROMANO, W.
POPP, K. H.	Estimated Availability of Surface and Ground	Water System Accessories,
Aeration by Means of Blast NozzleA Possi- bility for the Aeration of Biological Waste	Water in the Pojoaque River Drainage Basin, Santa Fe County, New Mexico,	W75-11299 8C
Water Treatment Plants (Die Strahlduesen-	W75-10938 4A	ROSS, S. L.
begasungeine Moeglichkeit zur Belueftung	Estimated Mean-Monthly and Annual Runoff	Oil Spill Technology, W75-11001 5G
biologischer Klaeranlagen), W75-11124 5D	at Selected Sites in the Pojoaque River Drainage Basin, Santa Fe County, New Mex-	ROTEM, J.
PRASAD, R. K.	ico.	Relations Between Algal Populations and the
A Practical Way to Find Minimum Drainage	W75-10943 2E	pH of Their Media,
Area for a Well, W75-11290 4B	REMUS, G. A.	W75-11028 5C
manus .	Vacuum Distillation/Vapor Filtration Water	RUSHING, W. N.
PREJS, A.	Recovery,	Water Hyacinth Research in Puerto Rico, W75-11215 5G
Experimentally Increased Fish Stock in the Pond Type Lake Warniak. IV. Feeding of In-	W75-11315 5D	77-11213
troduced and Autochthonous Non-Predatory	RICE, R. L.	RUUHIJARVI, R.
Fish,	Upgrading Metal-Finishing Facilities to Reduce	A General Description of the Oligotrophic Lake
W75-11234 5C	Pollution. (Part 2). Waste Treatment, W75-11325 5D	Paajarvi, Southern Finland, and the Ecological Studies on It,
PRESSER, T. S.		W75-11229 5C
The Minor and Trace Elements, Gas, and Isotope Compositions of the Principal Hot	RICHARDSON, C.	RYAN, J.
Springs of Nevada and Oregon,	Occurrence of 2, 4, 5-T and Picloram in Surface Runoff Water in the Blacklands of Texas,	Salt and Specific Ion Effects on Germination of
W75-10937 2K	W75-10895 5B	Four Grasses,
PRIOR D. II	W 15-10055	W75-10894 2K
PRICE, R. K. The Design of Storm Water Drainage Channels	RICHARDSON, L. V.	SAHA, A. K.
Using Mathematical Model Techniques,	Water Level Manipulation: A Tool for Aquatic	Effect of Soil-Water Relations on the Root
W75-11150 8B	Weed Control, W75-11216 4A	Porosity, Transpiration and Ion Uptake in Rice, W75-10916
PROZESKY, O. W.	RIKE, J. L.	
Drug Resistant Coliforms Call for Re-Evalua-	How to Make Squeeze Cementing Successful,	SAKAMAKI, Y.
tion of Water Quality Standards, W75-11130 5B	W75-11286 8F	Uranium Mineralization by Ground Water in Sedimentary Rocks, Japan.
W 75-11130	DIODDAN M A	W75-11145 2F
PYTKOWICZ, R. M.	RIORDAN, M. A. Basic Concepts and Practical Aspects of Corro-	0.00 0 W
Near-Bottom Chemistry in the Eastern Pacific	sion Investigation,	SATO, G. K. Investigation of the Influence of Thermal
and North Atlantic Oceans, W75-10923 2K	W75-11271 8G	Discharge from a Large Electric Power Station
W 13-10723	DODDING C W	on the Temperature and Near-Shore Circula-
RAIBLE, R. W.	ROBBINS, C. W. Use of Amendments to Reduce Water Require-	tion of Lake Michigan,
Survival and Growth Rate of Channel Catfish	ments for Stand Establishment of Small-Seeded	W75-11190 50
as a Function of Dissolved-Oxygen Concentra- tion,	Crops,	SATO, N.
W75-11051 5C	W75-11045 3F	Water Quality Control in Sewage Water Treat-
BANDATE A B	ROBERTS, B. R.	ment, (In Japanese),
RANDALL, A. D. Streamflow in the New York Part of the	Two-Dimensional, Hydrostatic Simulation of	W75-11133 5D
Susquehanna River Basin,	Thermally-Influenced Hydrodynamic Flows,	SCHMIDT, S.
W75-10931 2E	W75-10901 2H	Concurrent Nitrification-Denitrification at the
RANDALL, J. H.	ROBERTS, K. P.	Sediment-Water Interface as a Mechanism for Nitrogen Losses from Lakes,
Hydrogeology and Water Resources of Middle	Australian Arid Zone Streangauging,	W75-10902 50
Kirkland Creek Basin, Yavapai County,	W75-11307 2E	
Arizona,	ROBINSON, B. P.	SCHNEIDER, G.
W75-10872 4B	Quality of Water in Aquifers of the Amargosa	Changes in Vegetation and Surface Soil Proper ties Following Irrigation of Woodlands with
RAPP, J. B.	Desert and Vicinity, Nevada,	Municipal Wastewater,
The Minor and Trace Elements, Gas, and	W75-10932 5B	W75-11243 5F
Isotope Compositions of the Principal Hot	ROBINSON, L. R. JR.	SCHDECK C R
Springs of Nevada and Oregon, W75-10937 2K	How Silica Affects Iron Removal from	SCHRECK, C. B. Aquatic Plant Control Using Herbicides in a
2K	Groundwater,	Large Potable Water Supply,
RAWASH, I. A.	W75-11016 5F	W75-11201 50
Standard Curves for Nuvacron, Malathion,	ROCHESTER, E. W.	SCHULENBURG, E. L.
Sevin, DDT, and Kelthane Tested Against the Mosquito Culex Pipiens L. and the	Scheduling and Application Rates of Irrigation	A Waterborne Gastroenteritis Epidemic in Picc
Microcrustacean Daphnia Magna Straus,	in a Humid Climate,	Rivers, California,
W75-11082 5B	W75-11048 3F	W75-11005 51
DEDUIN M	ROE, L. A.	SEARS, J. W.
REBHUN, M. The Mechanism of Flocculation Processes in	Some Results on Mass Transfer Processes in a	The Impact of the Safe Drinking Water Act of
the Presence of Humic Stubtances,	Density-Stratified Flow,	Utilities,
W75-10958 SD	W75-11057 8B	W75-10859 50

SECOR, G. A.	SKOGERBOE, G. V.	SPROUL, O. J.
The Mechanics of Rock Failure Due to Water	An Implicit Approach to Pricing Agricultural	Virus Removal and Inactivation During Water
Jet Impingement,	Water Transfers to Urban Uses,	Treatment,
W75-11272 8E	W75-11178 4A	W75-10991 5D
		CTANADA A C
SEKINE, T.	SLEATH, J. F. A.	STANLEY, J. G.
Water Quality Control in Sewage Water Treat-	Transition in Oscillatory Flow Over Rippled	Unisex Studies on the White Amur,
ment, (In Japanese),	Beds,	W75-11205 5C
W75-11133 5D	W75-11149 8B	STANNETT, V. T.
COLUMN DE	CIV B C	Solute-Solute Interactions in Ultrafiltration
SELTZER, R. E.	SLY, P. G.	Treatment of Paper Mill Wastes,
Economic Analysis of Effluent Guidelines:	Sediment Processes in Great Lakes,	W75-11334 5D
Meat Packing Industry,	W75-11237 2J	
W75-11249 5G	SMIAROWSKI, J. F.	STARLING, M. B.
SENGUPTA, S.	Floodplain Land-Use Management: An Appli-	A Contribution to the Biology of Nitella
Size-Sorting During Suspension Transporta-	cation of Operations Research Methodology,	Hookeri A. BR. in the Rotorua Lakes, New
tion-Lognormality and Other Characteristics,	W75-11037 6F	Zealand. II. Organic Nutrients and Physical
W75-11162 2J	W/3-1103/	Factors,
11771100	SMITH, L. L. JR.	W75-11235 5C
SHIBATA, H.	Factors Influencing Acute Toxicity Estimates	STASIUK, W. N.
Retention of Cadmium in Mice Studied by	of Hydrogen Sulfide to Freshwater Inver-	Evidence of Atmospheric Transport of Ozone
Whole Body Autoradiography,	tebrates,	into Urban Areas,
W75-11024 5A	W75-11027 5C	W75-11169 5A
		W15-11105
SHIBAYAMA, Z.	SMITH, L. S.	Nitrogen Removal by Catalyst-Aided Break-
Studies on the Relationship Between Dry-	Drug Resistant Coliforms Call for Re-Evalua-	point Chlorination,
Matter Production and the Development of a	tion of Water Quality Standards,	W75-10965 5D
Pine Forest on Coastal Sand Dunes (1), (In	W75-11130 5B	
Japanese),		STEFFEN, A. J.
W75-11098 4A	SMITH, M. O.	Upgrading Meat Packing Facilities to Reduce
	Evapotranspiration of Four Forest Types Mea-	Pollution. (Part 1). In-Process Modifications
SHIMODO, M.	sured With the Eddy Correlation Technique,	and Pretreatment,
Advanced Wastewater Treatment (In	W75-11044 2D	W75-11320 5D
Japanese),		Upgrading Poultry-Processing Facilities to
W75-11114 5D	SMITH, P. A.	Reduce Pollution. (Part 2). Pretreatment of
	Aquatic Weed Field Test Program Using a CO2	Poultry-Processing Wastes,
SHIRATO, M.	Electric Discharge Convection Laser,	W75-11329 5D
Slurry Deliquoring by Expression,	W75-11208 5A	W/3-11329
W75-10969 5D	CAUDED D E	STEPHENS, S. K.
CHARLEST AND AND AND	SNYDER, R. E.	The Measurement and Estimation of Lake
SHUSTER, W. W.	How Steam is Produced and Handled at the	Evaporation from Four Australian Water
Nitrogen Removal by Catalyst-Aided Break-	Geyers,	Storages,
point Chlorination,	W75-11280 4B	W75-11300 2D
W75-10965 5D	SNYDER, W. M.	
SICCAMA, T. G.	Predicting Recessions Through Convolution,	STEWART, K. W.
Vegetation, Soil, and Climate on the Green	W75-10917 2E	Automated Distribution of Gauge and Shift
Mountains of Vermont,	W/5-1071/	Corrections, W75-10911 7C
W75-11021 2I	SOMMERFELDT, T. G.	W/3-10911
11/0-11/021	A Pneumatic System to Pump Water from	Automated Hourly Computations,
SIMMLER, J. J.	Piezometers,	W75-10915 7C
Acid Strip Mine Lake Recovery,	W75-11257 8C	
W75-11224 5C		Automated Tidal Computations,
	SOPPER, W. E.	W75-10912 7C
SIMONS, D. B.	Dissipation of Phenoxy Herbicides Applied to	Flow File Operations Manual
Turbulent Structure Near Smooth Boundary,	Riparian Vegetation,	Flow File Operations Manual, W75-10913 70
W75-11148 8B	W75-11214 5B	11 /3-10913
000 to 1	CONTICED D	STICKEL, R.
SIMS, P. L.	SPEISER, P.	Aeration by Means of Blast Nozzle A Possi-
Guidelines for Revegetation and Stabilization	Oxidation of Organic Compounds in Water	bility for the Aeration of Biological Waste
of Surface Mined Areas in the Western States,	(Oxidation organischer Verbindungen in	Water Treatment Plants (Die Strahlduesen-
W75-11100 4D	Wasser),	begasungeine Moeglichkeit zur Belueftung
SINGH, J. S.	W75-11118 5D	biologischer Klaeranlagen),
Seasonal Variation in Composition, Plant	SPENCER, N. R.	W75-11124 / 5E
Biomass, and Net Primary Productivity of a	Biological Control of Eurasian Water Milfoil,	CHONEC T
Tropical Grassland at Kurukshetra, India,		STONES, T.
	W75-11203	
	W75-11203 4A	
W75-11006 21		Oxidation of Sewage,
W75-11006 21	W75-11203 4A SPRING, B. J. Huntingdon Research Centre Pasveer Oxida-	Oxidation of Sewage,
	SPRING, B. J.	Oxidation of Sewage, W75-11116 51
W75-11006 21 SINGH, T. Specific Conductance Method for in Situ Esti-	SPRING, B. J. Huntingdon Research Centre Pasveer Oxida-	W75-11116 5D Nitrogenous Changes During the Settlement of
W75-11006 21 SINGH, T. Specific Conductance Method for in Situ Estimation of Total Dissolved Solids,	SPRING, B. J. Huntingdon Research Centre Pasveer Oxidation PlantSix Years On,	Oxidation of Sewage, W75-11116 5E Nitrogenous Changes During the Settlement of Sewage,
W75-11006 21 SINGH, T. Specific Conductance Method for in Situ Estimation of Total Dissolved Solids,	SPRING, B. J. Huntingdon Research Centre Pasveer Oxidation PlantSix Years On,	Oxidation of Sewage, W75-11116 5E Nitrogenous Changes During the Settlement of Sewage,
W75-11006 21 SINGH, T. Specific Conductance Method for in Situ Estimation of Total Dissolved Solids, W75-11167 5A SINGH, V. P.	SPRING, B. J. Huntingdon Research Centre Pasveer Oxidation PlantSix Years On. W75-11115 SPRINKLE, C. L. A Study of Factors Controlling the Chemical	Oxidation of Sewage, W75-11116 Nitrogenous Changes During the Settlement of Sewage, W75-11120 STORR, D.
W75-11006 21 SINGH, T. Specific Conductance Method for in Situ Estimation of Total Dissolved Solids, W75-11167 5A	SPRING, B. J. Huntingdon Research Centre Pasveer Oxidation PlantSix Years On, W75-11115 SPRINKLE, C. L. A Study of Factors Controlling the Chemical Quality of Water in Cartwright Creek Basin,	Oxidation of Sewage, W75-11116 Nitrogenous Changes During the Settlement of Sewage, W75-11120 STORR, D. Wind-Snow Relations at Marmot Creek, Al
W75-11006 21 SINGH, T. Specific Conductance Method for in Situ Estimation of Total Dissolved Solids, W75-11167 5A SINGH, V. P.	SPRING, B. J. Huntingdon Research Centre Pasveer Oxidation PlantSix Years On. W75-11115 SPRINKLE, C. L. A Study of Factors Controlling the Chemical	Oxidation of Sewage, W75-11116 Nitrogenous Changes During the Settlement of Sewage, W75-11120 51

c

В

F

G

Practical Application of Surface Fixed-System How Downhole Temperatures, Pressures Af-

STOTT, P. E.

The Water Industry in Transition, W75-11252 3E	for Multi-Purpose Sprinkler Irrigation Uses, (In Japanese),	Environments with Wireline Data,
75	W75-11097 3F	W75-11295 8G
STRANGE, R. J.		W D 11 F
Aquatic Plant Control Using Herbicides in a	TASH, J. C.	How Downhole Temperatures, Pressures Af- fect Drilling; Part 6: Correlating Geopressure
Large Potable Water Supply,	Some Limnological Characteristics of Arivaca	Gradients with Hydrocarbon Accumulations,
W75-11201 5G	Lake in Southern Arizona, W75-10891 2H	W75-11296 8G
STREET, R. L.	W 75-10891	
Two-Dimensional, Hydrostatic Simulation of	TATE, R. L. III	How Downhole Temperatures, Pressures Af-
Thermally-Influenced Hydrodynamic Flows,	Stability of Nitrosamines in Samples of Lake	fect Drilling; Part 7: The Shale Resistivity Ratio
W75-10901 2H	Water, Soil, and Sewage,	 A Valuable Tool for Making Economic Drilling Decisions,
	W75-11019 5B	W75-11297 8G
STRIPLING, T.	TAWARA, S.	
Predicting Cavitation in Sudden Enlargements,	The Influence of the Warm Cooling Water from	How Downhole Temperatures, Pressures Af-
W75-11151 8B	a Fossil Fueled Power Plant on Oceanographic	fect Drilling; Part 8: Needless Spending of
STROEHLEIN, J. L.	Conditions and Composition of Plankton in	Drilling and Exploration Money Can Be Pre- dicted-And Prevented,
Salt and Specific Ion Effects on Germination of	Owase Bay I. Water Temperature in Relation to	W75-11298 8G
Four Grasses,	Distribution of Microplankton, (In Japanese),	
W75-10894 2K	W75-11030 5C	TOERIEN, D. F.
	TEIDDA A B	South African Eutrophication Problems: A Per-
STURGES, D. L.	TEJEDA, A. R.	spective,
Hydrologic Relations on Undisturbed and Con-	System for Softening and Dealkalizing Water by Electrodialysis,	W75-11131 5C
verted Big Sagebrush Lands: The Status of Our	W75-11065 SF	TORPEY, W. N.
Knowledge, W75-11313 4D	71	Wastewater Treatment Plant,
W75-11313 4D	TEMME, K. E.	W75-11076 5D
SUGIURA, M.	Flocculation Device for Waste Fluid Treat-	TRANS B F
Biodegradation of Components of Pulp Waste	ment,	TRAIN, R. E.
Effluents by Bacteria. (1). Degradation of Kraft	W75-11077 5D	Facing the Real Cost of Clean Water, W75-10857 5G
Lignin (In Japanese),	THOMPSON, W. E.	11/3-10037
W75-11346 5B	Field Tests of Slow-Release Herbicides,	TRIMBLE, S. W.
SUNAHARA, H.	W75-11193 5G	Denudation Studies: Can We Assume Stream
Device for Automatic Determination of		Steady State,
Suspended Solids Content in Water,	THOMSON, S. V.	W75-11154 2J
W75-11063 5A	Phytophthora Species in Arizona: Its Occur-	TSCHANTZ, B. A.
311	rence in Recycled Irrigation water,	Laboratory Investigation of One-Dimensional
SWANSON, J. W.	W75-10883 5A	Wave Motion in Open Channels,
Effect of Lime Treatment on Molecular Weight	THORUD, D. B.	W75-11172 8B
Distribution of Color Bodies from Kraft Liner-	An Assessment of Snowpack Depletion-Sur-	TSIMBAL, I. M.
board Decker Effluents,	face Runoff Relationships on Forested	Influence of Oil on Nucleic Acids of Algae,
W75-11345 5D	Watersheds,	W75-11080 50
SYERS, J. K.	W75-11049 4A	Influence of Oil on Musicia Aside of Alone
Interference of Mercury(II) in the Colorimetric	Development of a Bibliographic Information	Influence of Oil on Nucleic Acids of Algae, W75-11232 50
Determination of Inorganic Phosphate in	System for Water Yield Improvement Prac-	11/3-11232
Water,	tices,	TSUBOI, K.
W75-11340 5A	W75-11050 10B	Studies on the Relationship Between Dry
SYLVIA, A. E.	THEN OW E II	Matter Production and the Development of a Pine Forest on Coastal Sand Dunes (1), (Ir
Activated Carbon in the Water Treatment	THURLOW, E. H. The Water Quality and Bottom Sediment	Japanese),
Plant,	Characteristics of New Jersey Lagoon	W75-11098 4A
W75-10992 5D	Developments,	
	W75-11104 5B	TSURUTA, A.
SYMMES, K. H.		The Influence of the Warm Cooling Water from a Fossil Fueled Power Plant on Oceanographic
Preliminary Investigations into Copper Cycling	TIBBALS, C. H.	Conditions and Composition of Plankton is
in Indian Lake, Massachusetts: A Lake Treated Annually with Copper Sulfate,	Recharge Areas of the Floridan Aquifer in Seminole County and Vicinity, Florida,	Owase Bay I. Water Temperature in Relation to
W75-11039 5B	W75-10944 7C	Distribution of Microplankton, (In Japanese),
-	11 10 10 10	W75-11030 50
SZLAUER, L.	TILLEY, L. J.	TSUTSUI, R. T.
Use of Steelon-Net Veils for Protection of the	Use of Productivity of Periphyton to Estimate	Nitrogen Removal in the Operation of th
Hydro-Engineering Works Against Dreissena	Water Quality,	Mililani Sewage Treatment Plant,
Polymorphia Pall,	W75-10936 5B	W75-11041 51
W75-11033 5G	TILLMAN, R. W.	THE LE
TAFELSKI, R. D.	Interference of Mercury(II) in the Colorimetric	TULLIS, J. P. Predicting Cavitation in Sudden Enlargements,
Colorado City Solves Its Sand Pumping	Determination of Inorganic Phosphate in	W75-11151
Problems,	Water,	
W75-11261 8C	W75-11340 5A	TUNTURI, P. J.
TAKEUCHI, Y.	TIMEO D I	Study of Electrochemical Treatment Metho
Cultivation of Netted Melon By Use of Trickle	TIMKO, D. J. How Downhole Temperatures, Pressures Af-	for Removing Colloidal Particles from Pulp an
Irrigation in a Sand Field Plastic Greenhouse,	fect Drilling; Part 4: Pitfalls in Overpressure	Paper Industry Effluents (Tutkimus selluteo lisuuden jatevesien kolloidaalisten aineste
(In Japanese).	Prediction,	poistomahdollisuudesta sahkokemialliesti),
W75-11095 3F	W75-11294 8G	W75-11348 5

-

fn G

re G

io ic G

of eiG

5D

5G

2J nal 8B

5C 5C

(In 4A

ohic in n to

), 5C

the 5D

nts, 8B

thod

and teol-

sten

5D

UDIS, B.	WAGNER, J. R.	WELLINGS, L. W.
An Economic Analysis of the Pollution	Institutional Arrangements for Reducing Con-	The Effect of Irrigation on the Yield and Quali-
Problems in the Colorado River Basin: The	flict Over Water Quality in International	ty of Maincrop Potatoes,
Upper Main Stem Sub-Basin,	Rivers, .	W75-11106 3F
W75-11247 5G	W75-11242 6E	WELLS C. C.
PURIOU LC	WATERY C.C.	WELLS, C. G.
ULRICH, J. C. Possibilities of Reutilization of Kaolin from	WALDEN, C. C.	Water Pollution Problems in Salisbury, Rhode- sia: Present and Future,
	Effluent Characteristics and Treatment of	W75-10983 5G
Biological Waste Water Sludges	Mechanical Pulping Effluents, W75-11331 SD	W 75-10903 3G
(Moeglichkeiten der Wiederverwertung von	W75-11331 5D	WELLS, P. B.
Kaolin aus biologischen Abwasserchlaemmen), W75-11349 5D	WALKER, C. R.	Upgrading Meat Packing Facilities to Reduce
W75-11349 5D	Herbicide Chemicals and Their Effect on the	Pollution. (Part 2). Waste Treatment,
UNLUATA, U.	Aquatic Environment,	W75-11321 5D
Effects of Entrance Loss on Harbor Oscilla-	W75-11211 5C	
tions,		WELLS, W. J. JR.
W75-11147 8B	Registration of Aquatic Herbicides,	Upgrading Meat Packing Facilities to Reduce
	W75-11212 4A	Pollution. (Part 2). Waste Treatment, W75-11321 5D
URIE, D.		W/3-11321 3D
Changes in Vegetation and Surface Soil Proper-	WALKER, R.	WEST, A. S.
ties Following Irrigation of Woodlands with	Pump Selection,	The Effects of Experimental Blackfly (Diptera:
Municipal Wastewater,	W75-11002 8C	Simuliidae) Larviciding with Abate, Dursban,
W75-11243 5B	WALKER, R. D.	and Methoxychlor on Stream Invertebrates,
VALCIK, J. A.	The Awareness of the Relevant Water	W75-11157 5C
Algae in Baltimore's Reservoirs,	Resources Literature by the Personnel of the	
W75-11221 5C	Wisconsin Department of Natural Resources,	WETZEL, R. G.
W/3-11221	W75-10899 10C	Dissolved Organic Matter and Lake Metabol-
VAN HORN, S. L.	100	ism,
Aquatic Plant Control Using Herbicides in a	WALKER, W. R.	W75-11188 5C
Large Potable Water Supply,	An Implicit Approach to Pricing Agricultural	WHITE, D. P.
W75-11201 5G	Water Transfers to Urban Uses,	Changes in Vegetation and Surface Soil Proper-
	W75-11178 4A	ties Following Irrigation of Woodlands with
VANDEGRIFT, A. E.		Municipal Wastewater,
Water Pollution from Nonpoint Sources,	WALLACE, R. R.	W75-11243 · 5B
W75-11158 5B	The Effects of Experimental Blackfly (Diptera:	
VARMA, M. M.	Simuliidae) Larviciding with Abate, Dursban,	WHITE, G. C.
Population Dynamics of Protozoa in Waste-	and Methoxychlor on Stream Invertebrates,	Disinfecting Wastewater with Chlorina-
water.	W75-11157 5C	tion/Dechlorination Part 1, W75-10963 5D
W75-10957 5D	WALLIS, J. R.	W /3-10963
35	Relative Importance of Decision Variables in	Disinfecting Wastewater with Chlorina-
VAUGHAN, C. M. JR.	Flood Frequency Analysis,	tion/Dechlorination Part 2,
Covariance Analysis of Reservoir Development	W75-10929 4A	W75-10964 5D
Effects on Property Tax Base,		********
W75-10851 6B	WALTHER, C. K.	WHITE, L.
WATER CO. A	Flocculation Device for Waste Fluid Treat-	A Computer Program Package for Aquatic Ecologists,
VAUT, G. A.	ment,	W75-10908 2H
The Economics of Flood Insurance: An Analy-	W75-11077 5D	W 75-10900 211
sis of the National Flood Insurance Program, W75-11038 6F	WANG, L. K.	WHITE, L. M.
W75-11038 6F	Total Waste Recycle System for Water Purifi-	Development of a Bibliographic Information
VERSCHUEREN, G.	cation Plant Using Alum as Primary Coagulant,	System for Water Yield Improvement Prac-
A Note on Salinity and Temperature in Some	W75-11094 5D	tices,
Moroccan Brackish Waters,		W75-11050 10B
W75-10997 2L	WARD, N. E.	WHITE, W. R.
	Mill Experience in the Treatment of Mechani-	The Design of Storm Water Drainage Channels
VESILIND, P. A.	cal Pulping Effluent,	Using Mathematical Model Techniques,
Preserving Activated Sludge,	W75-11332 5D	W75-11150 8B
W75-10962 5D	WATANABE, Y.	
VILA, F.	A Planning of Catchment Sewerage for Oyodo	WHITEHURST, C. A.
Weyl's Theory of Glaciation Supported by	River (In Japanese),	The Louisiana Environmental Management
Isotopic Study of Norwegian Core K 11,	W75-11113 5D	System and Its Utility in Water Resource
W75-11153 2J	30	Planning,
23	WATKINS, J. JR.	W75-11177 / 5G
VIRMANI, S. M.	Can a Computer Really Operate a Water-Filtra-	WHITTEMORE, R. C.
Estimation of Safe Periods for Crop Planning	tion Plant,	Evaluation of the Adsorptive Properties of Fly
Under Dryland Agriculture,	W75-11184 5F	Ash with Reference to a Pulp and Paper Mill
W75-10926 3F	WATCON N H F	Waste Effluent,
VOLUENWEIDER R. A.	WATSON, N. H. F.	W75-11335 + 5D
VOLLENWEIDER, R. A. Primary Production in Lakes Optorio and Eries	Seasonal Abundance of Crustacean Zooplank- ton and Net Plankton Biomass of Lakes Huron.	WICEPU T M I
Primary Production in Lakes Ontario and Erie:	Erie, and Ontario,	WIGLEY, T. M. L.
A Comparative Study, W75-11217 5C	W75-11238 5C	Condensation in Jets, Industrial Plumes and Cooling Tower Plumes,
		W75-11166 2B

WEATHERFORD, G. D.

the Colorado River, W75-10869

Impact of Energy Development on the Law of WILKES, D. J.

4C

Settlement and Sludge Return in Activated-Sludge Type Package Plants, W75-10973 5D

5B

Heavy Metals and Other Trace Elements, W75-10934

AUTHOR INDEX

WILKINGON, B. II.	
WILKINSON, B. H.	YASUDA, M.
Matagorda Island, Texas: The Evolution of a Gulf Coast Barrier Complex,	Studies on Toxicity of Sodium Nifurstyrenate (NFS-NA) in Cultured Yellowtail (In
W75-11144 2L	Japanese),
WILKINSON, C.	W75-11034 5C
Concurrent Nitrification-Denitrification at the	YATES, P.
Sediment-Water Interface as a Mechanism for Nitrogen Losses from Lakes,	Predicting Recessions Through Convolution, W75-10917 2E
W75-10902 5C	
WILLEY, L. M.	YEATTS, L. B. Calcium Sulfate Solubility in Brackish Water
The Minor and Trace Elements, Gas, and	Concentrates and Applications to Reverse Os-
Isotope Compositions of the Principal Hot Springs of Nevada and Oregon,	mosis Processes: Polyphosphate Additives, W75-11004 5D
W75-10937 2K	
WILLIE C	YEVICH, P. P.
WILLIS, C. Floodplain Land-Use Management: An Appli-	Copper Toxicity in Busycon Canaliculatum L., W75-11031 5C
cation of Operations Research Methodology,	
W75-11037 6F	YOUNG, R. H. F. Nitrogen Removal in the Operation of the
WILLIS, J. F.	Mililani Sewage Treatment Plant,
Operation Clean Sweep, W75-11192 5G	W75-11041 5D
W75-11192 5G	ZAWADZKI, E. A.
WILSON, A. D.	Mobile Unit for Treating Liquid Waste,
Water Consumption and Water Turnover of Sheep Grazing Semiarid Pasture Communities	W75-11073 5D
in New South Wales,	ZEIGER, C. F.
W75-10888 3F	Operation Clean Sweep, W75-11192 5G
WITSELL, W. J.	
Pitless Adapters: Emphasis on Sanitation,	ZETTLER, F. W. Utilization of Phytopathogens as Biocontrols
W75-11258 8C	for Aquatic Weeds,
WRIGHT, G. L.	W75-11206 5G
Multilag Markov Models for Eastern Australian Streams.	ZIEBELL, C. D.
W75-11301 2E	Some Limnological Characteristics of Arivaca
WRIGHT, S. T. C.	Lake in Southern Arizona, W75-10891 2H
The Role of Endogenous Abscisic Acid in the	
Response of Plants to Stress,	ZUCK, G. J. The Awareness of the Relevant Water
W75-11319 3F	Resources Literature by the Personnel of the
WU, C.	Wisconsin Department of Natural Resources,
Ground Water Depletion and Subsidence	W75-10899 10C
Problems in Taipei Basin, W75-11262 4B	
YADAVA, P. S. Seasonal Variation in Composition, Plant	
Biomass, and Net Primary Productivity of a	
Tropical Grassland at Kurukshetra, India,	
W75-11006 2I	
YAMAMOTO, T.	
Cultivation of Netted Melon By Use of Trickle Irrigation in a Sand Field Plastic Greenhouse,	
(In Japanese),	
W75-11095 3F	
Nozzle Hydraulics in the Trickle Irrigation	
SystemRelation Between Water Temperature	
and Nozzle Flow Rate (In Japanese), W75-11096 3F	
Practical Application of Surface Fixed-System for Multi-Purpose Sprinkler Irrigation Uses, (In	
Japanese),	
W75-11097 3F	

YANG, J. Y.
Total Waste Recycle System for Water Purifi-cation Plant Using Alum as Primary Coagulant, W75-11094
5D

YAROSH, M. M. Status of Waste Heat Utilization and Dual-Pur-pose Plant Projects, W75-11251

ORGANIZATIONAL INDEX

ACI ENVIRONICS, MELBOURNE	Mosquito Culex Pipiens L. and the	ARIZONA UNIV., TUCSON. DEPT. OF SOILS,
(AUSTRALIA).	Microcrustacean Daphnia Magna Straus,	WATER AND ENGINEERING.
Finite-Element Method for Water-Distribution	W75-11082 5B	Management of Southwestern Desert Soils,
Networks,	ALL INDIA COORDINATED DRVI AND	W75-10877 2G
W75-11186 4A	ALL-INDIA COORDINATED DRYLAND	C. T. of the December Constitution
AGENCY OF INDUSTRIAL SCIENCE AND	AGRICULTURE RESEARCH PROJECT,	Soils of the Desert Southwest,
	HISSAR.	W75-10878 2G
TECHNOLOGY, TOKYO (JAPAN). (ASSIGNEE)	Estimation of Safe Periods for Crop Planning	Salt and Specific Ion Effects on Germination of
Device for Automatic Determination of	Under Dryland Agriculture,	Four Grasses,
Suspended Solids Content in Water,	W75-10926 3F	W75-10894 2K
W75-11063 5A	AMERICAN CVANAMID CO. CTAMPORD	W 75-10054
AGRICULTURAL RESEARCH SERVICE,	AMERICAN CYANAMID CO., STAMFORD,	ARIZONA UNIV., TUCSON. DEPT. OF
ATHENS, GA. SOUTHEAST WATERSHED	CONN. (ASSIGNEE)	WATERSHED MANAGEMENT.
RESEARCH CENTER.	Process for Treating Sewage Sludge, W75-11064 5D	Differential Release of Water from Arizona
Predicting Recessions Through Convolution,	W75-11064 5D	Snowpacks,
W75-10917 2E	Process for Treating Industrial Wastes,	W75-10860 2C
W/3-10317	W75-11066 5D	
AGRICULTURAL RESEARCH SERVICE,	W13-11000	An Analysis of the Motor-Row Conversion
BELTSVILLE, MD.	Process for Treating Industrial Wastes,	Issue of Colorado River Float Trips,
Biological Control of Alligator Weed, 1959-	W75-11067 5D	W75-10867 6B
1972,		
W75-11202 5G	Process for Raw Water Clarification,	Shrub Transplanting for Watershed Manage-
	W75-11072 5F	ment and Range Improvement in Iran.
AGRICULTURAL RESEARCH SERVICE,		W75-10870 4D
COLLEGE STATION, TEX.	AMES LAB., IOWA.	Seasonal Variations in the Infiltration Rate of a
Occurrence of 2, 4, 5-T and Picloram in Sur-	Chromatographic Determination of Phenols in	
face Runoff Water in the Blacklands of Texas,	Water,	Whitehouse Soil in Southern Arizona, W75-10873
W75-10895 5B	W75-11344 5A	W /3-108/3
		ARIZONA UNIV., TUCSON. INST. OF
AGRICULTURAL RESEARCH SERVICE, FORT	AMOCO PRODUCTION CO., TULSA, OKLA.	GOVERNMENT RESEARCH.
LAUDERDALE, FLA.	(ASSIGNEE)	Institutional Arrangements for Reducing Con-
Chemical Control of Egeria Densa,	Oil Separator with Coalescing Media,	flict Over Water Quality in International
W75-11199 5G	W75-11071 5G	Rivers,
		W75-11242 · 6E
AGRICULTURAL RESEARCH SERVICE,	ARIZONA UNIV., TUCSON.	1175-11242
GAINESVILLE, FLA. BIOLOGICAL CONTROL	Barrenness of Desert Pavement in Yuma Coun-	ARIZONA UNIV., TUCSON. SCHOOL OF
LAB.	ty, Arizona,	RENEWABLE NATURAL RESOURCES.
Biological Control of Eurasian Water Milfoil,	W75-10868 2G	An Assessment of Snowpack Depletion-Sur-
W75-11203 4A		face Runoff Relationships on Forested
IN CORPORA AL LOCATION DE LA CONTRACTOR	Some Limnological Characteristics of Arivaca	Watersheds,
AHLSTROM (A.) OSAKEYHTIO, VARKAUS	Lake in Southern Arizona,	W75-11049 4A
(FINLAND). PAPER AND PULP DIV.	W75-10891 2H	
Treating Effluents from a Sulphite Pulp Mill by	ARIZONA UNIV., TUCSON. DEPT. OF	Development of a Bibliographic Information
Flotation,	BIOLOGICAL SCIENCES.	System for Water Yield Improvement Prac-
W75-11347 5D	Phenology of Selected Sonoran Desert Plants at	tices,
ALABAMA AGRICULTURAL EXPERIMENT	Punta Cirio, Sonora, Mexico.	W75-11050 10E
STATION, AUBURN.	W75-10862 21	ANTI-MOLOURING CAMPBERS OF STREET
Scheduling and Application Rates of Irrigation	W /3-10802	ARKANSAS UNIV., FAYETTEVILLE. DEPT. OF
in a Humid Climate,	The Influence of Rainfall on the Reproduction	BOTANY AND BACTERIOLOGY.
W75-11048 3F	of Sonoran Desert Lagomorphs,	Biochrome Analysis as a Method for Assessing
W/3-11046 3F	W75-10871 4A	Phytoplankton Dynamics, Phase II,
ALASKA UNIV., COLLEGE. DEPT. OF	17.5-100/1	W75-11052 5C
BIOLOGICAL SCIENCES.	Limnology of Desert Ponds,	ARKANSAS UNIV., FAYETTEVILLE. DEPT. OF
Effects of Some Components of Crude Oil on	W75-10880 2H	ZOOLOGY.
Young Coho Salmon,		Pathogenic Free-Living Amoebae in Arkansas
W75-11088 5C	ARIZONA UNIV., TUCSON. DEPT. OF CIVIL	Recreational Waters,
	ENGINEERING AND ENGINEERING	W75-11053 5A
ALBERTA UNIV., EDMONTON.	MECHANICS.	11 /3-11033 3A
Formulation of Boundary Conditions at the	Factors Affecting Erosion in a Semi-Arid	ARKANSAS UNIV., LITTLE ROCK. DEPT. OF
Surface of a Porous Medium,	Watershed,	ELECTRONICS AND INSTRUMENTATION.
W75-11269 8B	W75-10884 2J	Survival and Growth Rate of Channel Catfish
		as a Function of Dissolved-Oxygen Concentra-
ALBERTA UNIV., EDMONTON. DEPT. OF	ARIZONA UNIV., TUCSON. DEPT. OF	tion,
BOTANY.	HYDROLOGY AND WATER RESOURCES.	W75-11051 5C
The Growth of Some Epiphytic Algae in a Lake	Hydrogeology and Water Resources of Middle	
Receiving Thermal Effluent,	Kirkland Creek Basin, Yavapai County,	ARMY ENGINEER DISTRICT, GALVESTON,
W75-11225 5C	Arizona,	TEX.
	W75-10872 4B	Aquatic Plant Control on Lake Corpus Christi,
ALBERTA UNIV., EDMONTON. DEPT. OF	M	W75-11194 5C
ZOOLOGY.	Measurement of Cobble Abrasion in Natural	
Effect of DDT and M.S. 222 on Learning a	Streams,	ARMY ENGINEER DISTRICT,
Simple Conditioned Response in Rainbow	W75-10881 2J	JACKSONVILLE, FLA.
Trout (Salmo gairdneri),	ADIZONA UNIV. TUCCON DEDT. OF DEALTH	Operation Clean Sweep,
W75-11025 5C	ARIZONA UNIV., TUCSON. DEPT. OF PLANT	W75-11192 5C
AT THE ANDRESS AND ADDRESS AND	SCIENCES.	ABAY ENGINEER DISTRICT NEW OFF
ALEXANDRIA UNIV. (EGYPT). FACULTY OF	Use of Amendments to Reduce Water Require-	ARMY ENGINEER DISTRICT, NEW ORLEANS
AGRICULTURE.	ments for Stand Establishment of Small-Seeded	LA.
Standard Curves for Nuvacron, Malathion,	Crops,	Field Tests of Slow-Release Herbicides,
Sevin DDT and Kelthane Tested Against the	W75-11045 3F	W75-11193 50

ARMY ENGINEER WATERWAYS EXPERIMENT STATION,

ARMY ENGINEER WATERWAYS	BOR ILAN UNIV., RAMAT-GAN (ISRAEL).	CALIFORNIA UNIV., DAVIS. DEPT. OF
EXPERIMENT STATION, VICKSBURG, MISS.	DEPT. OF LIFE SCIENCES.	IRRIGATION.
Aquatic Weed Field Test Program Using a CO2	Relations Between Algal Populations and the	Successful Irrigation: Preparation, Realization,
Electric Discharge Convection Laser, W75-11208 5A	pH of Their Media, W75-11028 5C	Exploritation, (Savoir Irriguer: Preparation, Realisation, Exploitation),
COOL FILL W. III		W75-10874 3F
CO2 Laser Effects on Water Hyacinth, W75-11209 5G	BOSTON METROPOLITAN DISTRICT	CALIFORNIA UNIV., LIVERMORE.
W/3-11209	COMMITTEE, MASS.	LAWRENCE LIVERMORE LAB.
Operations Platforms,	The Impact of the Safe Drinking Water Act on	Computer Algorithms Useful for Determining a
W75-11210 4A	Utilities, W75-10859 5G	Subsurface Electrical Profile Via High
	W 73-10839	Frequency Probing,
Water Hyacinth Research in Puerto Rico,	BRADLEY UNIV., PEORIA, ILL. DEPT. OF	W75-10910 8G
W75-11215 5G	BIOLOGY.	CALIFORNIA UNIV., LOS ANGELES. SCHOOL
ASSOCIATED ENGINEERING SERVICES LTD.,	Species Diversity of Benthic Macroin-Ver-	OF LAW.
VANCOUVER (BRITISH COLUMBIA).	tebrates and Limnological Conditions in a 1st	Impact of Energy Development on the Law of
Pump Selection,	Order Mountain Stream,	the Colorado River,
W75-11002 8C	W75-10918 2I	W75-10869 4C
ATMOSPHERIC ENVIRONMENT SERVICE,	BRITISH COLUMBIA WATER RESOURCES	CATABODAYA TRANSI T OC ANGEL DO BLAMBO
CALGARY (ALBERTA).	SERVICE, VANCOUVER.	CALIFORNIA UNIV., LOS ANGELES. WATER
Wind-Snow Relations at Marmot Creek, Al-	Water Resources,	RESOURCES CENTER. Sprinkler Irrigation Practice, (La Pratique De
berta.	W75-11003 5G	L'Irrigation Par Aspersion),
W75-11226 2C		W75-10875 3F
ANIGOTA AND TRAIN AND ANIAN DEPART AND DEPART	BUNDESGESUNDHEITSAMT, BERLIN (WEST	
AUCKLAND UNIV. (NEW ZEALAND). DEPT.	GERMANY). INSTITUT FUER WASSER-,	CAMBRIDGE UNIV. (ENGLAND). DEPT. OF
A Contribution to the Biology of Nitella	BODENUND LAFTHYGIENE.	APPLIED BIOLOGY.
Hookeri A. BR. in the Rotorua Lakes, New	Tensids (Syndets) and the Water Pollution	Cost Evaluation of Watercourse Management
Zealand, II. Organic Nutrients and Physical	Problem, (Gesund-Heitliche Aspekte Des Ten- sid-Gebrauchs),	in Essex, W75-11008 5G
Factors,	W75-11134 5D	W/3-11006
W75-11235 5C		CAMBRIDGE UNIV. (ENGLAND). DEPT. OF
AUTOTROL CORR MILWAUGE MIC	BUREAU OF METEOROLOGY, MELBOURNE	ENGINEERING.
AUTOTROL CORP., MILWAUKEE, WIS. (ASSIGNEE)	(AUSTRALIA).	Hierarchial Model for Water-Supply-System
Wastewater Treatment Plant,	The Measurement and Estimation of Lake	Control,
W75-11076 5D	Evaporation from Four Australian Water	W75-10996 4A
	Storages, W75-11300 2D	Transition in Oscillatory Flow Over Rippled
AXEL JOHNSON INSTITUTET FOR	W/5-11300	Beds,
INDUSTRIFORSKNING, NYNASHAMN	BUREAU OF RECLAMATION, DENVER,	W75-11149 8B
(SWEDEN). ENGINEERING DEPT. Lamella Sedimentation: A Compact Separation	COLO. HYDRAULICS BRANCH.	
Technique,	Cavitation Control by Aeration of High-	CANADA CENTRE FOR INLAND WATERS,
W75-10989 5D	Velocity Jets,	BURLINGTON (ONTARIO). Advances in the Detection of Water Pollutants,
	W75-11152 8B	W75-10995 5A
B.C. RESEARCH, VANCOUVER(BRITISH	BUREAU OF SPORT FISHERIES AND	
COLUMBIA). Effluent Characteristics and Treatment of	WILDLIFE, STUTTGART, ARK. FISH	Primary Production in Lakes Ontario and Erie
Mechanical Pulping Effluents,	FARMING EXPERIMENT STATION.	A Comparative Study, W75-11217 50
W75-11331 5D	Unisex Studies on the White Amur,	W75-11217 50
	W75-11205 5C	Microbiological Examination of Offshore Lake
Mill Experience in the Treatment of Mechani-	BUREAU OF SPORT FISHERIES AND	Erie Sediments,
cal Pulping Effluent, W75-11332 5D	WILDLIFE, WASHINGTON, D.C. DIV. OF	W75-11218 50
W75-11332 5D	FISHERY RESEARCH.	Chelation Study of Copper (II): Fulvic Acid
BALTIMORE CITY DEPT. OF PUBLIC	Herbicide Chemicals and Their Effect on the	System,
WORKS, MD. WATER SUPPLY TREATMENT	Aquatic Environment,	W75-11219 5E
AND PUMPING DIV.	W75-11211 5C	
Algae in Baltimore's Reservoirs,	CALCIUMA METROPOLITAN	Application of the Manometric Technique in
W75-11221 5C	CALCUTTA METROPOLITAN	the Study of Sediment Oxygen Depletion, W75-11222 50
BECK (R. W.) AND ASSOCIATES, SEATTLE,	DEVELOPMENT AUTHORITY (INDIA).	W75-11222 50
WASH.	Electrolytic Control of Algae, W75-11228 5F	In Situ Measurement of the Settling Velocity
Advanced Techniques in the Mathematical	1173-11220	Profile of Particulate Organic Carbon in Lake
Modeling of Water-Distribution Systems,	CALGON CORP., PITTSBURGH, PA. CALGON	Ontario,
W75-11183 4A	LABS.	W75-11227 50
BELL, GALYARDT AND WELLS, OMAHA,	Interference of Sulfate Ion on SPADNS	Sediment Processes in Great Lakes,
NEBR.	(Sodium 2-(Sulfophenylazo)-1,8-Dihydrox-	W75-11237 2
Upgrading Meat Packing Facilities to Reduce	ynaphthalene-3,6-Disulfonate) Colorimetric	
Pollution. (Part 2). Waste Treatment,	Determination of Fluorine in Waste Waters, W75-11343 5A	Seasonal Abundance of Crustacean Zooplank
W75-11321 5D		ton and Net Plankton Biomass of Lakes Huron Erie, and Ontario,
BELL TELEPHONE LABS., INC., WHIPPANY,	CALIFORNIA UNIV., BERKELEY. DEPT. OF	W75-11238 50
N.J.	PLANT PATHOLOGY.	
The Mechanics of Rock Failure Due to Water	Phytophthora Species in Arizona: Its Occur-	The Utilization of Sun-Glint in a Study of Lak
Jet Impingement,	rence in Recycled Irrigation water,	Dynamics,
W75-11272 8E	W75-10883 5A	W75-11239 57

ORGANIZATIONAL INDEX DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WATER RESOURCES BRANCH.

Preliminary Information on the Nature of Or-	COLORADO UNIV., BOULDER.	How Downhole Temperatures, Pressures Af-
ganic Matter in the Surface Sediments of Lakes	An Economic Analysis of the Pollution	fect Drilling; Part 6: Correlating Geopressure
Huron, Erie, and Ontario,	Problems in the Colorado River Basin: The	Gradients with Hydrocarbon Accumulations,
W75-11240 2J	Upper Main Stem Sub-Basin,	W75-11296 8G
CANBERRA COLL. OF ADVANCED	W75-11247 5G	How Downhole Temperatures, Pressures Af-
EDUCATION (AUSTRALIA).	COLORADO UNIV., BOULDER. INST. OF	fect Drilling; Part 7: The Shale Resistivity Ratio
Fertilizer Phosphate in Streams and Lakes,	ARCTIC AND ALPINE RESEARCH; AND	- A Valuable Tool for Making Economic
W75-11310 5B	COLORADO UNIV., BOULDER. DEPT. OF	Drilling Decisions,
	GEOGRAPHY.	W75-11297 8G
CAPE TOWN UNIV. (SOUTH AFRICA). DEPT.	An Elevational Control of Peak Snowpack	
OF WATER RESOURCES AND PUBLIC	Variability,	How Downhole Temperatures, Pressures Af-
HEALTH ENGINEERING.	W75-11155 2C	fect Drilling; Part 8: Needless Spending of Drilling and Exploration Money Can Be Pre-
Aeration Devices: Basic Theory,		dicted-And Prevented.
W75-10971 5D	COMMINS (J. A.) AND ASSOCIATES, INC.,	W75-11298 8G
CENTRAAL PLANBUREAU, THE HAGUE	FORT WASHINGTON, PA.	00
(NETHERLANDS).	Upgrading Meat Packing Facilities to Reduce	CONTINENTAL OIL CO., PONCA CITY,
The Economic Impact of Pollution Abatement:	Pollution. (Part 3). Choosing the Optimum	OKLA. PRODUCTION RESEARCH DEPT.
The Case of Water Pollution by Degradable Or-	Financial Strategy, W75-11322 5D	How Downhole Temperatures, Pressures Af-
ganic Matter,	W /3-11322	fect Drilling; Part 4: Pitfalls in Overpressure
W75-11254 5G	COMMONWEALTH SCIENTIFIC AND	Prediction,
	INDUSTRIAL RESEARCH ORGANIZATION,	W75-11294 8G
CENTRAL MICHIGAN UNIV., MT. PLEASANT.	CANBERRA (AUSTRALIA). DIV. OF LAND USE	CORNELL UNIV., ITHACA, N.Y.
DEPT. OF BIOLOGY.	RESEARCH.	A Computer Program Package for Aquatic
Seasonal Abundance and Diversity of Benthos	Natural and Fertilizer Nitrogen in Streams and	Ecologists,
in a Southern Illinois, USA Swamp,	Lakes,	W75-10908 2H
W75-11312 2H	W75-11311 5B	
CENTRE NATIONAL DE LA RECHERCHE		Prescriptive Economic Models for Nonstruc-
CENTRE NATIONAL DE LA RECHERCHE	COMMONWEALTH SCIENTIFIC AND	tural Flood Control,
SCIENTIFIQUE, GIF-SUR-YVETTE (FRANCE). CENTRE DES FAIBLES RADIOACTIVITIES.	INDUSTRIAL RESEARCH ORGANIZATION,	W75-11060 6F
Weyl's Theory of Glaciation Supported by	CANBERRA (AUSTRALIA). DIV. OF PLANT	The Effects of Free Ammonia and Free
Isotopic Study of Norwegian Core K 11,	INDUSTRY.	Nitrous Acid on the Nitrification Process,
W75-11153 2J	Balancing the Effects of Man's Actions on the	W75-11101 . 5D
	Hydrological Cycle, W75-10865 2A	
CHEMFIX, INC., PITTSBURGH, PA.	W /3-10803 2A	CORNELL UNIV., ITHACA, N.Y. DEPT. OF
(ASSIGNEE)	COMMONWEALTH SCIENTIFIC AND	AGRICULTURAL ENGINEERING.
Mobile Unit for Treating Liquid Waste,	INDUSTRIAL RESEARCH ORGANIZATION,	Temperature Effects on Microbial Growth in CSTR's,
W75-11073 5D	DENILIQUIN (AUSTRALIA). RIVERINA LAB.	W75-10968 . 5D
CHEMIEFACED I ENZINC A C (ALICTRIA)	Water Consumption and Water Turnover of	
CHEMIEFASER LENZING A.G. (AUSTRIA).	Sheep Grazing Semiarid Pasture Communities	CORNELL UNIV., ITHACA, N.Y. DEPT. OF
Measures in the Sulfite Pulp Industry for	in New South Wales,	AGRONOMY.
Decreasing Waste Water Load (Massnahmen	W75-10888 3F	Some Observations Concerning Preparation
der Sulfitzellstoff-Industrie zur Minderung der Abwasserbelastung),	CONCORDIA UNIV., MONTREAL (QUEBEC).	and Storage of Stream Samples for Dissolved
W75-11339 5D	DEPT. OF CIVIL ENGINEERING.	Inorganic Phosphate Analysis, W75-11336 5A
	Wave Motion in Rockfill,	W 75-11330
CINCINNATI UNIV., OHIO.	W75-10924 8D	CORNELL UNIV., ITHACA, N.Y. LAB. OF SOIL
Water and Wastewater Disinfection with		MICROBIOLOGY.
Ozone: A Critical Review,	CONNECTICUT UNIV., STORRS.	Stability of Nitrosamines in Samples of Lake
W75-10956 5D	Measures of Biodegradability and Refractory	Water, Soil, and Sewage,
COLORADO STATE UNIV., FORT COLLINS.	Organics in Wastewaters: (Analysis, Interpreta-	W75-11019 5B
DEPT. OF AGRICULTURAL ENGINEERING.	tion, and Application of Measurement	CORROSION CONTROL TECHNOLOGISTS,
Consolidation and Rehabilitation of Canals in	Techniques),	HOUSTON, TEX.
Poudre Valley,	W75-11103 5D	Basic Concepts and Practical Aspects of Corro-
W75-11061 4A	CONNECTICUT UNIV., STORRS. DEPT. OF	sion Investigation,
	CIVIL ENGINEERING.	W75-11271 8G
An Implicit Approach to Pricing Agricultural	Effect of Pressure Gradient on Wind-Waves in	
Water Transfers to Urban Uses,	a Laboratory Channel,	DEPARTMENT OF THE ENVIRONMENT,
W75-11178 4A	W75-11093 8B	LETHBRIDGE (ALBERTA). RESEARCH STATION.
COLOR LDG COLUMN FORE COLLING		A Pneumatic System to Pump Water from
COLORADO STATE UNIV., FORT COLLINS.	CONTINENTAL OIL CO., HOUSTON, TEX.	
DEDOC OF LESSO OPPOSED COMPLETE		Piezometers
DEPT. OF ATMOSPHERIC SCIENCE.	Conoco Technology Curbs Production Pollu-	Piezometers, W75-11257 8C
Analysis of Colorado Precipitation,	Conoco Technology Curbs Production Pollution,	W75-11257 8C
	Conoco Technology Curbs Production Pollu-	W75-11257 8C DEPARTMENT OF THE ENVIRONMENT,
Analysis of Colorado Precipitation,	Conoco Technology Curbs Production Pollu- tion, W75-11267 5G	W75-11257 8C DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WATER RESOURCES
Analysis of Colorado Precipitation, W75-11040 2B COLORADO STATE UNIV., FORT COLLINS.	Conoco Technology Curbs Production Pollu- tion, W75-11267 5G How to Find Transition Zones in Soft Forma-	W75-11257 8C DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WATER RESOURCES BRANCH.
Analysis of Colorado Precipitation, W75-11040 2B	Conoco Technology Curbs Production Pollu- tion, W75-11267 5G	W75-11257 8C DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WATER RESOURCES BRANCH. Automated Distribution of Gauge and Shift
Analysis of Colorado Precipitation, W75-11040 2B COLORADO STATE UNIV., FORT COLLINS. DEPT. OF RANGE SCIENCE.	Conoco Technology Curbs Production Pollu- tion, W75-11267 How to Find Transition Zones in Soft Forma- tions, W75-11285 8G	W75-11257 8C DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WATER RESOURCES BRANCH. Automated Distribution of Gauge and Shift Corrections,
Analysis of Colorado Precipitation, W75-11040 2B COLORADO STATE UNIV., FORT COLLINS. DEPT. OF RANGE SCIENCE. Guidelines for Revegetation and Stabilization	Conoco Technology Curbs Production Pollution, W75-11267 5G How to Find Transition Zones in Soft Formations, W75-11285 8G CONTINENTAL OIL CO., HOUSTON, TEX.	W75-11257 8C DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WATER RESOURCES BRANCH. Automated Distribution of Gauge and Shift
Analysis of Colorado Precipitation, W75-11040 2B COLORADO STATE UNIV., FORT COLLINS. DEPT. OF RANGE SCIENCE. Guidelines for Revegetation and Stabilization of Surface Mined Areas in the Western States, W75-11100 4D	Conoco Technology Curbs Production Pollution, W75-11267 5G How to Find Transition Zones in Soft Formations, W75-11285 8G CONTINENTAL OIL CO., HOUSTON, TEX. PRODUCTION ENGINEERING SERVICES.	W75-11257 8C DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WATER RESOURCES BRANCH. Automated Distribution of Gauge and Shift Corrections, W75-10911 7C Automated Tidal Computations,
Analysis of Colorado Precipitation, W75-11040 2B COLORADO STATE UNIV., FORT COLLINS. DEPT. OF RANGE SCIENCE. Guidelines for Revegetation and Stabilization of Surface Mined Areas in the Western States, W75-11100 4D COLORADO STATE UNIV., FORT COLLINS.	Conoco Technology Curbs Production Pollution, W75-11267 5G How to Find Transition Zones in Soft Formations, W75-11285 8G CONTINENTAL OIL CO., HOUSTON, TEX. PRODUCTION ENGINEERING SERVICES. How Downhole Temperatures, Pressures Af-	W75-11257 8C DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WATER RESOURCES BRANCH. Automated Distribution of Gauge and Shift Corrections, W75-10911 7C
Analysis of Colorado Precipitation, W75-11040 2B COLORADO STATE UNIV., FORT COLLINS. DEPT. OF RANGE SCIENCE. Guidelines for Revegetation and Stabilization of Surface Mined Areas in the Western States, W75-11100 4D COLORADO STATE UNIV., FORT COLLINS. HYDRO MACHINERY LAB.	Conoco Technology Curbs Production Pollution, W75-11267 5G How to Find Transition Zones in Soft Formations, W75-11285 8G CONTINENTAL OIL CO., HOUSTON, TEX. PRODUCTION ENGINEERING SERVICES. How Downhole Temperatures, Pressures Affect Drilling; Part 5: Predicting Hydrocarbon	W75-11257 8C DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WATER RESOURCES BRANCH. Automated Distribution of Gauge and Shift Corrections, W75-10911 7C Automated Tidal Computations, W75-10912 7C
Analysis of Colorado Precipitation, W75-11040 2B COLORADO STATE UNIV., FORT COLLINS. DEPT. OF RANGE SCIENCE. Guidelines for Revegetation and Stabilization of Surface Mined Areas in the Western States, W75-11100 4D COLORADO STATE UNIV., FORT COLLINS.	Conoco Technology Curbs Production Pollution, W75-11267 5G How to Find Transition Zones in Soft Formations, W75-11285 8G CONTINENTAL OIL CO., HOUSTON, TEX. PRODUCTION ENGINEERING SERVICES. How Downhole Temperatures, Pressures Af-	W75-11257 8C DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WATER RESOURCES BRANCH. Automated Distribution of Gauge and Shift Corrections, W75-10911 7C Automated Tidal Computations,

on, on, 3F

g a igh 8G DL of 4C R De 3F

sG

4A pled 8B

nts, 5A
Sinterior Sinterio

2J lankuron, 5C Lake

ORGANIZATIONAL INDEX

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WATER RESOURCES BRANCH.

Description of Card and Tape Formats for Sup- plying Data to Users.	ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. TECHNOLOGY	FLORIDA UNIV., GAINESVILLE. DEPT. OF PLANT PATHOLOGY.
W75-10914 7C	TRANSFER STAFF. Upgrading Meat Packing Facilities to Reduce	Comparison of Uredo Eichhorniae, the Water- hyacinth Rust, and Uromyces Pontederiae,
Automated Hourly Computations, W75-10915 7C	Pollution. (Part 1). In-Process Modifications and Pretreatment,	W75-11092 5G
DETROIT UNIV. MICH DEBT OF BIOLOGY	W75-11320 5D	Utilization of Phytopathogens as Biocontrols for Aquatic Weeds.
Biological Control: Isolation and Bacterial Ox-	Pollution Abatement in a Brewing Facility. W75-11323 5D	W75-11206 5G
idation of the Taste-and-Odor Compound	W 75-11323	FOOD AND AGRICULTURAL ORGANIZATION
Geosmin, W75-11013 5F	Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 2). Pretreatment of	OF THE UNITED NATIONS, ROME (ITALY); AND UNITED NATIONS EDUCATIONAL,
DEUTSCHE TEXCO A.G., HAMBURG. (WEST	Poultry-Processing Wastes,	SCIENTIFIC, AND CULTURAL
GERMANY). (ASSIGNEE) System for Optimal Pressure Control in a	W75-11329 5D	ORGANIZATION, PARIS (FRANCE). Soil Map of the World, 1:5,000,000, Volume
Multi-Stage Evaporation Unit,	ENVIRONMENTAL PROTECTION SERVICE,	IV, South America.
W75-11070 3A	OTTAWA (ONTARIO).	W75-11138 7C
	Role and Responsibilities of the Environmental Protection Service (Canada),	FOOD AND AGRICULTURE ORGANIZATION
DEVELOPMENT PLANNING AND RESEARCH ASSOCIATES, INC., MANHATTAN, KANS.	W75-11000 6G	OF THE UNITED NATIONS, ROME (ITALY).
Economic Analysis of Effluent Guidelines:	ENVIRONMENTAL BROTECTION SERVICE	Improving Productivity in Low Rainfall Areas,
Meat Packing Industry,	ENVIRONMENTAL PROTECTION SERVICE, OTTAWA (ONTARIO). ENVIRONMENTAL	in India.
W75-11249 5G	EMERGENCY BRANCH.	W75-11099 3F
DIAMOND SHAMROCK CORP., CLEVELAND,	Oil Spill Technology,	Land and Water Resources Survey in the Jebel
OHIO. (ASSIGNEE)	W75-11001 5G	Marra Area, The Sudan.
Electrolytic Sea Water Process,	ENVIRONMENTAL PROTECTION SERVICE,	W75-11139 4A
W75-11068 3A	OTTAWA (ONTARIO). WATER POLLUTION	FOOD AND AGRICULTURE ORGANIZATION
EACT LANCING MEDIDIAN WATER AND	CONTROL DIRECTORATE.	OF THE UNITED NATIONS, ROME (ITALY).
EAST LANSING-MERIDIAN WATER AND SEWER AUTHORITY, EAST LANSING, MICH.	Workshop on Computer-Aided Design and	LAND AND WATER DEVELOPMENT DIV.
City/Township Joint VentureA New Water	Simulation of Waste Treatment Systems. W75-11338 5D	Man's Influence on the Hydrological Cycle: A
Plant,	W75-11338 5D	Draft Report of the UNESCO/FAO Working Group on the International Hydrological
W75-11015 5F	ENVIRONMENTAL QUALITY RESEARCH	Decade.
	AND DEVELOPMENT UNIT. NEW YORK	W75-10863 2A
ELLSWORTH ENGINEERING AND ASSOCIATES, IDAHO FALLS, IDAHO.	STATE DEPT. OF ENVIRONMENTAL	PORTOR CERTIFICE (UCD.). AT BUOLEDOUR
Algae Removal Using Dissolved Air Flotation,	CONSERVATION, ALBANY. Nitrogen Removal by Catalyst-Aided Break-	FOREST SERVICE (USDA), ALBUQUERQUE, N. MEX. ROCKY MOUNTAIN FOREST AND
W75-10978 . 5D	point Chlorination, W75-10965 5D	RANGE EXPERIMENT STATION. Revegetating Disturbed Areas in the Semiarid
ENVIRONMENTAL ENGINEERING, INC.,	W 73-10903	Southwest,
GAINESVILLE, FLA.	FISH AND WILDLIFE SERVICE, COLUMBIA,	W75-10892 4D
Upgrading Poultry-Processing Facilities to	MO. FISH-PESTICIDE RESEARCH LAB.	PORTOR CERTIFICATION AND AND COLUMN
Reduce Pollution. (Part 1). In-Process Pollution	Toxaphene Effects on Growth and Bone Com- position of Fathead Minnows, Pimephales	FOREST SERVICE (USDA), FORT COLLINS, COLO. ROCKY MOUNTAIN FOREST AND
Abatement, W75-11328 5D	Promelas,	RANGE EXPERIMENT STATION.
	W75-11026 5C	Hydrologic Relations on Undisturbed and Con-
ENVIRONMENTAL PROTECTION AGENCY,	FISHERIES AND MARINE SERVICE,	verted Big Sagebrush Lands: The Status of Our
ATHENS, GA. SURVEILLANCE AND	WINNIPEG (MANITOBA).	Knowledge, W75-11313 4D
ANALYSIS DIV. Waste Water Survey, St. Regis Paper Com-	The Toxicity of Drilling Fluid Components to	W/3-11313
pany, Cantonment, Florida.	Aquatic Biological Systems, A Literature	Watershed Management in the Black Hills: The
W75-11314 5D	Review,	Status of Our Knowledge, W75-11318 4D
ENUIDONMENTAL BROTECTION ACENON	W75-11266 5C	W75-11318 4D
ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.	FISHERIES AND MARINE SERVICE,	FOREST SERVICE (USDA), PHOENIX, ARIZ.
Facing the Real Cost of Clean Water,	WINNIPEG (MANITOBA). RESOURCE	ROCKY MOUNTAIN FOREST AND RANGE
W75-10857 5G	MANAGEMENT BRANCH. Acute Toxicity of Petrochemical Drilling Fluids	EXPERIMENT STATION. Effects of Pinyon-Juniper Removal on Natural
PARTIDONIA PARTA I BROTPOTTON ACTIVON	Components and Wastes to Fish,	Resource Products and Uses in Arizona,
ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. DIV. OF WATER SUPPLY.	W75-11265 5C	W75-10886 3B
Pitless Adapters: Emphasis on Sanitation,	FLORIDA DEPT. OF NATURAL RESOURCES,	FOREST SERVICE, (USDA), TUCSON, ARIZ.
W75-11258 8C	TALLAHASSEE.	ROCKY MOUNTAIN FOREST AND RANGE
PHIMONIAPHTAI PROTECTION ACENCY	Aquatic Plant Research and Control in Florida,	EXPERIMENT STATION.
ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. OFFICE OF PESTICIDE	W75-11195 4A	Establishing Alkali Sacaton on Harsh Sites in
PROGRAMS.	FLORIDA UNIV. AT MARINELAND, ST.	the Southwest, W75-10882 4A
Criteria for Herbicide Evaluation,	AUGUSTINE. C.V. WHITNEY MARINE LAB.	W75-10882 4A
W75-11196 5G	Impact of Thermal Effluent from Steam-Elec-	GAME BIOLOGY STATION, RONDE
Registration of Herbicides for Aquatic Use,	tric Station on a Marshland Nursery Area dur-	(DENMARK).
W75-11197 5G	ing the Hot Season, W75-11032 5C	Oil Pollution and Seabirds in Denmark 1935- 1968,
		W75-10893 5C
ENVIRONMENTAL PROTECTION AGENCY,	FLORIDA UNIV., GAINESVILLE. DEPT. OF	
WASHINGTON, D.C. OFFICE OF WATER PROGRAM OPERATIONS.	COASTAL AND OCEANOGRAPHIC ENGINEERING.	GENERAL AMERICAN TRANSPORTATION CORP., NILES, ILL.
Considerations for Preparation of Operation	Effects of Entrance Loss on Harbor Oscilla-	Vacuum Distillation/Vapor Filtration Water
and Maintenance Manuals,	tions,	Recovery,
W75-11317 5D	W75-11147 8B	W75-11315 5D

ter-5G rols 5G ON

me 7C

N eas,

3F ebel 4A

N :: A king

2A

arid 4D

Con-Our 4D The 4D

3B

s in

935-5C

ater

5D

GENERAL ELECTRIC CO., PHILADELPHIA, PA. RE-ENTRY AND ENVIRONMENTAL	GEOLOGICAL SURVEY, RESTON, VA. Determination of Regional Hydraulic Conduc-	GULF COAST RESEARCH LAB., OCEAN SPRINGS, MISS.
SYSTEMS DIV. Macroscopic Distribution-System Modeling,	tivity Through Use of C-14 Dating of Ground- water,	Transplanting Sea Grass in Mississippi Sound, W75-11207 4A
W75-11185 4A	W75-10930 2F	
GENESEE COMMUNITY COLL., BATAVIA, N.Y. MATHEMATICS AND SCIENCE DIV.	Ground Water in the Corvallis-Albany Area, Central Willamette Valley, Oregon,	HALLIBURTON SERVICES, MONAHANS, TEX. Simple Field Checks Will Provide Accurate DST Data,
A Simple and Inexpensive Technique for Determining Colored Light Intensity Un-	W75-10940 2F	W75-11281 8G
derwater, W75-10919 7B	An Appraisal of Potential Water Salvage in the Lake McMillen Delta Area, Eddy County, New	HAMPTON ROADS SANITARY DISTRICT, NORFOLK, VA.
	Mexico,	Milestone Water Legislation Accompanied by
GEOLOGICAL SURVEY, ALBANY, N.Y. Streamflow in the New York Part of the	W75-10941 3B	Millstone of Bureaucratic Red Tape, W75-11007 5G
Susquehanna River Basin, W75-10931 2E	Water Resources of the Lower St. Croix River Watershed, East-Central Minnesota,	HAWAII UNIV., HONOLULU. WATER
GEOLOGICAL SURVEY, ALBUQUERQUE, N.	W75-10945 7C	RESOURCES RESEARCH CENTER. Nitrogen Removal in the Operation of the
MEX. Estimated Availability of Surface and Ground	Water Resources of the Snake River Watershed, East-Central Minnesota,	Mililani Sewage Treatment Plant, W75-11041 5D
Water in the Pojoaque River Drainage Basin,	W75-10946 7C	HAWAIIAN ELECTRIC CO., INC.,
Santa Fe County, New Mexico, W75-10938 4A	Water Resources of the Lower Minnesota River Watershed, South-Central Minnesota,	HONOLULU. ENVIRONMENTAL DEPT.
Estimated Mean-Monthly and Annual Runoff	W75-10947 7C	A Comparison of Effects of Elevated Tempera- ture Versus Temperature Fluctuations on Reef
at Selected Sites in the Pojoaque River	Water Resources of the Cannon River	Corals at Kahe Point, Oahu, W75-11084 5C
Drainage Basin, Santa Fe County, New Mexico,	Watershed, Southeastern Minnesota, W75-10948 7C	HELSINKI UNIV. (FINLAND), DEPT. OF
W75-10943 2E	GEOLOGICAL SURVEY, TACOMA, WASH.	BOTANY.
GEOLOGICAL SURVEY, BAY SAINT LOUIS, MISS.	Low-Flow Characteristics of Selected Streams in Northeastern Washington.	A General Description of the Oligotrophic Lake Paajarvi, Southern Finland, and the Ecological
Stochastic Analysis of Particle Movement Over	W75-10939 2E	Studies on It, W75-11229 5C
a Dune Bed, W75-10942 2J	The Hydrologic CycleAs Applicable to the	HELSINKI UNIVERSITY OF TECHNOLOGY,
GEOLOGICAL SURVEY, BOSTON, MASS.	Pacific Northwest, W75-10949 7C	OTANIEMI (FINLAND), DEPT. OF METALLURGY.
Map Showing Depth to Bedrock, Worthington Quadrangle, Massachusetts,	GEOLOGICAL SURVEY, TALLAHASSEE, FLA.	Study of Electrochemical Treatment Method for Removing Colloidal Particles from Pulp and
W75-10951 7C	Recharge Areas of the Floridan Aquifer in Seminole County and Vicinity, Florida,	Paper Industry Effluents (Tutkimus selluteol-
Map Showing Depth to Bedrock, Greenfield	W75-10944 7C	lisuuden jatevesien kolloidaalisten ainesten poistomahdollisuudesta sahkokemialliesti),
Quadrangle, Massachusetts, W75-10952 7C	GEORGIA INST. OF TECH., ATLANTA. DEPT.	W75-11348 5D
Map Showing Depth to Bedrock, Chester Quadrangle, Massachusetts, W75-10953 7C	OF CHEMICAL ENGINEERING. Bark as Trickling-Filter Dewatering Medium for Pulp and Paper Mill Sludge, W75-11241 5D	HOWARD UNIV., WASHINGTON, D.C. BIOENVIRONMENTAL ENGINEERING AND SCIENCES RESEARCH LAB. Population Dynamics of Protozoa in Waste-
GEOLOGICAL SURVEY, DENVER, COLO.	GEORGIA UNIV., ATHENS. SCHOOL OF	water,
Quality of Water in Aquifers of the Amargosa Desert and Vicinity, Nevada,	FOREST RESOURCES. Moisture and Energy Conditions in a Draining	W75-10957 5D HUNTINGDON RESEARCH CENTRE
W75-10932 5B	Soil Mass, W75-11054 2G	(ENGLAND). DEPT. OF BUILDING AND MAINTENANCE.
GEOLOGICAL SURVEY, HARTFORD, CONN. Contour Map of the Bedrock Surface, New	GHENT RIJKSUNIVERSITEIT (BELGIUM).	Huntingdon Research Centre Pasveer Oxida- tion PlantSix Years On,
Britain Quadrangle, Connecticut,	DEPT. OF ZOOLOGY. A Note on Salinity and Temperature in Some	W75-11115 5D
W75-10950 7C Map Showing Depth to Bedrock, Mount Car-	Moroccan Brackish Waters, W75-10997 2L	HYDRAULICS RESEARCH STATION, WALLINGFORD (ENGLAND).
mel Quandrangle, Connecticut,	GIFFELS ASSOCIATES, INC., DETROIT,	The Design of Storm Water Drainage Channels
	місн.	Using Mathematical Model Techniques, W75-11150 8B
GEOLOGICAL SURVEY, LAWRENCE, KANS. Temperatures of Kansas Streams,	Upgrading Poultry-Processing Facilities to Reduce Pollution. (Part 3). Waste Treatment.	IBM WATSON RESEARCH CENTER,
W75-10933 2E	W75-11330 5D	YORKTOWN HEIGHTS, N.Y. Relative Importance of Decision Variables in
GEOLOGICAL SURVEY, MENLO PARK, CALIF.	GOVIND BALLABH PANT UNIV. OF AGRICULTURE AND TECHNOLOGY,	Flood Frequency Analysis, W75-10929 4A
Heavy Metals and Other Trace Elements, W75-10934 5B	PANTNAGAR (INDIA). DEPT. OF SOIL SCIENCE.	ICARUS CORP., SILVER SPRING, MD.
Use of Productivity of Periphyton to Estimate	Effect of Soil-Water Relations on the Root Porosity, Transpiration and Ion Uptake in Rice,	How to Estimate and Escalate Costs of Waste- water Equipment,
Water Quality,	W75-10916 3F	W75-11014 5D
W75-10936 5B	GRUY (H. J.) AND ASSOCIATES, INC.,	IDAHO AGRICULTURAL EXPERIMENT
The Minor and Trace Elements, Gas, and Isotope Compositions of the Principal Hot	DALLAS, TEX. A Practical Way to Find Minimum Drainage	STATION, ABERDEEN. Available Water-Holding Capacities of Soils in
Springs of Nevada and Oregon, W75-10937 2K	Area for a Well, W75-11290 4B	Southern Idaho, W75-11140 2G

IFE UNIV. (NIGERIA). KAINJI DAM	INSTITUTE OF GAS TECHNOLOGY,	KENTUCKY WATER RESOURCES INST.,
RESEARCH PROJECT.	CHICAGO, ILL.	LEXINGTON.
The Effects of the Formation of Lake Kainji (Nigeria) Upon the Indigenous Fish Population,	Anaerobic Acidogenesis of Wastewater Sludge,	Covariance Analysis of Reservoir Development
W75-11223 5C	W75-10976 5D	Effects on Property Tax Base, W75-10851 6B
	INSTITUTE OF PAPER CHEMISTRY,	W 73-10831
ILLINOIS INST. OF TECH., CHICAGO.	APPLETON, WIS.	The Law of Water Allocation in Kentucky,
Interactions of Heavy Metals in the Activated	Effect of Lime Treatment on Molecular Weight	W75-10898 6E
Sludge Process, W75-11173 5D	Distribution of Color Bodies from Kraft Liner-	KEURINGSINSTITUUT VOOR
W/3-111/3	board Decker Effluents,	WATERLEIDING ARTIKELEN, RIJSWIJK
ILLINOIS STATE UNIV., NORMAL. COLL. OF	W75-11345 5D	(NETHERLANDS).
APPLIED SCIENCE AND TECHNOLOGY.	INSTITUTE OF TEXTILE TECHNOLOGY,	Continuous Automatic Monitoring of Surface
Wastewater Treatment Using Algae and Ar-	CHARLOTTESVILLE, VIRGINIA.	Water with Fish,
temia, W75-10967 5D	Upgrading Textile Operations to Reduce Pollu-	W75-11079 5A
W/3-1090/	tion. (Part 1). In-Plant Control of Pollution.	KIMBERLY-CLARK CORP., NEENAH, WIS.
ILLINOIS STATE WATER SURVEY, URBANA.	W75-11326 5D	(ASSIGNEE)
Corrosion by Domestic Waters,	INTERNATIONAL WATER SUPPLY LTD.,	Aerobic Lagoon Waste Treatment System and
W75-11062 5F	MONTREAL (QUEBEC).	Method,
Concentration and Genera of Algae in Selected	Horizontal Groundwater Collectors, Hydraulics	W75-11069 5D
Illinois Streams, 1971-1973,	and Design,	KIPINVEST, BUDAPEST (HUNGARY).
W75-11165 5A	W75-10998 8B	Papermaking Complex at Dunaujvaros
ILLINOIS UNIV., CHICAGO. DEPT. OF	TOWN TOWN TOWN COME OF	(Hungary) Preserving the Danube (Au com-
BIOLOGICAL SCIENCES.	IOWA UNIV., IOWA CITY. INST. OF	plexe papetier de Dunaujvaros preserver le
Absorption and Elimination of Photodieldrin by	HYDRAULIC RESEARCH. Thermal Response of Heated Streams, Solution	Danube),
Daphnia and Goldfish,	by the Implicit Method,	W75-11333 5D
W75-11085 5B	W75-10909 5B	
WITHOUTH LIBRARY DEBT OF		KURUKSHETRA UNIV. (INDIA). DEPT. OF
ILLINOIS UNIV., URBANA. DEPT. OF FORESTRY.	Investigation of the Operating Characteristics	BOTANY. Seasonal Variation in Composition, Plant
Guidelines for the Identification of Potential	of the Iowa Sediment Concentration Measuring	Biomass, and Net Primary Productivity of a
Environmental Impacts in the Construction and	System,	Tropical Grassland at Kurukshetra, India,
Operation of a Reservoir,	W75-11163 2J	W75-11006 2I
W75-11316 5C	IRVINE RANCH WATER DISTRICT, CALIF.	
INDIAN STATISTICAL INST., CALCUTTA.	A Solution to Pump Stoppages,	KYUNGPOOK NATIONAL UNIV., TAEGU
GEOLOGICAL STUDIES UNIT.	W75-11111 8C	(REPUBLIC OF KOREA), COLL. OF AGRICULTURE.
Size-Sorting During Suspension Transporta-		Effects of Irrigation in Rain-Fed Fields on the
tionLognormality and Other Characteristics,	IWATE PREFECTURE FISHERIES	Growth and Yield of Upland Rice Varieties, (In
W75-11162 2J	EXPERIMENTAL STATION, KAMAISHI (JAPAN).	Korean),
INSTITUT NATIONAL DE LA RECHERCHE	Mercury Contents in Biologically Preserved	W75-10853 3F
AGRONOMIQUE, DIJON (FRANCE).	Specimens of Menuke (Sebastes Baramenuke	LANGULARS INC. TELENORIE BA
LABORATOIRE DE MICROBIOLOGIE DES	and S. Flammeus),	LANCY LABS., INC., ZELIENOPLE, PA. Upgrading Metal-Finishing Facilities to Reduce
SOLS.	W75-11078 5A	Pollution. (Part 2). Waste Treatment,
The Use of Soil as a Purifying System	IOINT BUILD ICATIONS BESTABOU SERVICE	W75-11325 5D
(L'Utilisation du sol Comme Systeme Epu-	JOINT PUBLICATIONS RESEARCH SERVICE, ARLINGTON, VA.	
rateur), W75-11126 5D	Translations on Environmental Quality, No. 33.	LEICESTER UNIV (ENGLAND). PUBLIC
W 75-11120	W75-11246 5G	SECTOR ECONOMICS RESEARCH CENTRE.
INSTITUT NATIONAL DE LA RECHERCHE		Non-Renewable, Non-Energy Resources, W75-11253 6B
AGRONOMIQUE, VERSAILLES (FRANCE).	K-KONSULT, LUND (SWEDEN).	W 73-11233
SOILS LAB.	Industry and Community in Cooperation,	LOS ANGELES COUNTY HEALTH SERVICES
Limitations of Using a Simulation Model of the Soil Under Irrigated Cultivation to Simulate the	W75-10985 5D	DEPT., CALIF. IMMUNIZATION PROJECT.
Functioning of the Soil as a Purifying System	KANSAS CITY WATER DEPT., MO.	A Waterborne Gastroenteritis Epidemic in Pico
(Limites D'Utilisation D'Un Modele de Com-	Liquid CO2 Protects our Water's Quality,	Rivers, California,
portement du sol sous Culture Irriguee Pour	W75-10990 5F	W75-11005 5F
Simuler le Fonctionnment du sol Comme		LOUISIANA STATE UNIV., BATON ROUGE.
Systeme Epurateur),	KANSAS STATE UNIV., MANHATTAN. INST.	DIV. OF ENGINEERING RESEARCH.
W75-11125 5B	FOR SYSTEMS DESIGN AND OPTIMIZATION.	The Louisiana Environmental Management
INSTITUTE FOR MARINE ENVIRONMENTAL	Design of the Optimal Outfall System for a	System and Its Utility in Water Resource
RESEARCH, PLYMOUTH (ENGLAND).	Stream Receiving Thermal and Organic Waste Discharges,	Planning,
The Accumulation of Cadmium, Copper, Man-	W75-11137 5B	W75-11177 5G
ganese and Zinc by Fucus Vesiculosus in the		LOUISIANA WILD LIFE AND FISHERIES
Bristol Channel, W75-11083 5B	KEARNEY (A. T.) AND CO., INC., CHICAGO,	COMMISSION, TIOGA. AQUATIC WEED
1175-11003 3B	ILL.	RESEARCH.
INSTITUTE OF BIOLOGY OF THE SOUTHERN	Economic Analysis of Effluent Guidelines. Fer-	Water Level Manipulation: A Tool for Aquation
SEAS, ODESSA (USSR).	roalloys Industry. W75-11250 5G	Weed Control,
Influence of Oil on Nucleic Acids of Algae,	H 13-11230 3G	W75-11216 4A
W75-11080 . 5C	KENNEDY ENGINEERS, INC., TACOMA,	MAINE UNIV., ORONO. DEPT. OF CIVIL
INSTITUTE OF BIOLOGY OF THE SOUTHERN	WASH.	ENGINEERING.
SEAS, SEVASTOPOL (USSR).	Can a Computer Really Operate a Water-Filtra-	Virus Removal and Inactivation During Water
Influence of Oil on Nucleic Acids of Algae,	tion Plant,	Treatment,
W75-11232 5C	W75-11184 5F	W75-10991 5I

ORGANIZATIONAL INDEX NATIONAL COUNCIL OF THE PAPER INDUSTRY FOR AIR AND STREAM IMPROVEMENT,

MARYLAND UNIV., CATONSVILLE, DIV. OF	MICHIGAN STATE UNIV., EAST LANSING.	MONASH UNIV., CLAYTON (AUSTRALIA).
BIOLOGICAL SCIENCES. Adaptation of Copepod Populations to Thermal	DEPT. OF FORESTRY.	DEPT. OF CIVIL ENGINEERING.
Stress,	Changes in Vegetation and Surface Soil Proper-	Variability, Persistence and Yield of Australian
W75-11046 5C	ties Following Irrigation of Woodlands with Municipal Wastewater.	Streams, W75-11308 2E
***	W75-11243 5B	W75-11308 2E
MARYLAND UNIV., COLLEGE PARK. DEPT.	W13-11243	MOSUL UNIV. (IRAQ).
OF CHEMISTRY.	MICHIGAN STATE UNIV., HICKORY	Optimum Values for Operational Variables in
Behavior of Mn, Fe, Cu, Zn, Cd and Pb	CORNERS, W. K. KELLOGG BIOLOGICAL	Turbidity Removal,
Discharged from a Wastewater Treatment Plant	STATION.	W75-11110 5D
into an Estuarine Environment,	Dissolved Organic Matter and Lake Metabol-	W13-11110
W75-11160 5B	ism,	MWL TOOL AND SUPPLY CO., MIDLAND,
MARYLAND UNIV., COLLEGE PARK, DEPT.	W75-11188 5C	TEX.
OF CIVIL ENGINEERING.	Walland I was taken been an	Techniques for Linear Tie-Back Cementing,
Flood Runoff from Urban Areas,	MICHIGAN UNIV., ANN ARBOR. DEPT. OF	W75-11277 8F
W75-10904 5B	GEOLOGY AND MINERALOGY.	
	Matagorda Island, Texas: The Evolution of a	NAGASAKI UNIV. (JAPAN).
MASSACHUSETTS DEPT. OF PUBLIC	Gulf Coast Barrier Complex,	Studies on Toxicity of Sodium Nifurstyrenate
HEALTH, LAWRENCE. LAWRENCE	W75-11144 2L	(NFS-NA) in Cultured Yellowtail (In
EXPERIMENT STATION.	MICHIGAN UNIV., ANN ARBOR. DEPT. OF	Japanese),
Activated Carbon in the Water Treatment	NAVAL ARCHITECTURE AND MARINE	W75-11034 5C
Plant,	ENGINEERING.	Studies on the Inorganic Components of
W75-10992 5D	Economics of Great Lakes Shipping in an Ex-	Marine Animals-III, on the Contents of Cadmi-
MASSACHUSETTS INST. OF TECH.,	tended Season,	um, Zinc, Copper, Lead and Iron in Muscle
CAMBRIDGE. DEPT. OF CIVIL	W75-11248 6C	
ENGINEERING.		and Viscera of Marine Animals Captured in the West Sea Area of Kyushu, (In Japanese),
Experimental Study of the Cooling Water	MIDWEST RESEARCH INST., KANSAS CITY,	W75-11087 SC
System, Setubal Power Plant, Rio Sado, Portu-	MO.	11/2-1100/
gal,	Water Pollution from Nonpoint Sources,	NAGOYA UNIV. (JAPAN). DEPT. OF
W75-10855 5B	W75-11158 5B	CHEMICAL ENGINEERING.
	MINISTRY OF A CRICILITUDE STOCKHOLM	Slurry Deliquoring by Expression,
MASSACHUSETTS UNIV., AMHERST. DEPT.	MINISTRY OF AGRICULTURE, STOCKHOLM (SWEDEN).	W75-10969 5D
OF AGRICULTURAL AND FOOD ECONOMICS.	Water Conservation in Sweden: III. Current	
The Economics of Flood Insurance: An Analy-	Trends,	NAGOYA UNIV. (JAPAN). FACULTY OF
sis of the National Flood Insurance Program,	W75-10987 5G	AGRICULTURE.
W75-11038 6F	W 75-10507	Biodegradation of Components of Pulp Waste
W15-11050	MINNESOTA UNIV., MINNEAPOLIS. DEPT. OF	Effluents by Bacteria. (1). Degradation of Kraft
MASSACHUSETTS UNIV., AMHERST. DEPT.	GEOLOGY AND GEOPHYSICS.	Lignin (In Japanese),
OF FOOD AND RESOURCE ECONOMICS.	Study of Criteria and Models Establishing Op-	W75-11346 5B
Floodplain Land-Use Management: An Appli-	timum Level of Hydrogeologic Information for	NATIONAL BUREAU OF STANDARDS,
cation of Operations Research Methodology,	Groundwater Basin Management,	WASHINGTON, D.C. INST. FOR BASIC
W75-11037 6F	W75-11042 2F	STANDARDS.
MASSACHUSETTS UNIV., AMHERST. WATER	MINNESOTA UNIV., ST. PAUL. DEPT. OF	Note on the Measurement of the Response of
RESOURCES RESEARCH CENTER.	ENTOMOLOGY, FISHERIES AND WILDLIFE.	Oceanographic Temperature Sensors,
Environmental Impact Evaluation in Fresh-	Factors Influencing Acute Toxicity Estimates	W75-11146 7B
water Impoundments by Vegetation Analysis of	of Hydrogen Sulfide to Freshwater Inver-	
the Terrestrial Ecosystem,	tebrates,	NATIONAL CENTER FOR ATMOSPHERIC
W75-10905 2I	W75-11027 5C	RESEARCH, BOULDER, COLO.
P. P. J. S.		Charged Droplet Collision Efficiency Measure-
Preliminary Investigations into Copper Cycling	MISSISSIPPI STATE UNIV., MISSISSIPPI	ments,
in Indian Lake, Massachusetts: A Lake Treated Annually with Copper Sulfate,	STATE. DEPT. OF CIVIL ENGINEERING.	W75-11168 2B
W75-11039 5B	Organic Color in Groundwater of Mississippi,	NATIONAL CENTER FOR TOXICOLOGICAL
	W75-10907 5F	RESEARCH, JEFFERSON, ARK.
MASSEY UNIV., PALMERSTON NORTH (NEW	MISSISSIPPI STATE UNIV., MISSISSIPPI	Mutagens and Potential Mutagens in the Bio-
ZEALAND).	STATE, DIV. OF BUSINESS RESEARCH.	sphere: I. DDT and Its Metabolites,
Interference of Mercury(II) in the Colorimetric	A Case Study of Some Economic Aspects of	Polychlorinated Biphenyls, Chlorodioxins,
Determination of Inorganic Phosphate in	the National Flood Insurance Program,	Polycyclic Aromatic Hydrocarbons,
Water,	W75-10906 6F	Haloethers,
W75-11340 5A		W75-11170 5B
MELBOURNE AND METROPOLITAN BOARD	MISSISSIPPI UNIV., UNIVERSITY. DEPT. OF	
OF WORKS (AUSTRALIA).	MECHANICAL ENGINEERING.	Mutagens and Potential Mutagens in the Bio-
Detection of Change in Sequences of	Some Results on Mass Transfer Processes in a	sphere: II. MetalsMercury, Lead, Cadmium
Hydrologic Data,	Density-Stratified Flow,	and Tin,
W75-11302 7C	W75-11057 8B	W75-11171 5B
	MISSOURI UNIV., COLUMBIA. DEPT. OF	NATIONAL COUNCIL OF THE PAPER
MESA COLL., GRAND JUNCTION, COLO.	CIVIL ENGINEERING.	INDUSTRY FOR AIR AND STREAM
DEPT. OF BIOLOGICAL SCIENCES. The Use of Snakes as a Pollution Indicator	Acid Strip Mine Lake Recovery,	IMPROVEMENT, INC., NEW YORK.
Species.	W75-11224 5C	Evaluation of the Adsorptive Properties of Fly
Species, W75-11089 5B		Ash with Reference to a Pulp and Paper Mill
75-11009 3B	MOBIL RESEARCH AND DEVELOPMENT	Waste Effluent,
METCALF AND EDDY, INC., BOSTON, MASS.	CORP., DALLAS, TEX.	W75-11335 5D
Upgrading Textile Operations to Reduce Pollu-	Subsurface Water Tool for Petroleum Ex-	
tion. (Part 2). Wastewater Treatment Systems.	ploration,	NATIONAL ENVIRONMENTAL RESEARCH
W75-11327 5D	W75-11289 4B	CENTER, CINCINNATI, OHIO. METHODS

d

s I-

nt a 2I

F

ce 5D

6B

ico 5F

ent rce 5G

atic 4A

ater

DEVELOPMENTS AND QUALITY ASSURANCE	NEW MEXICO STATE UNIV., CLOVIS. PLAINS	NIHON SUIDO CONSULTANTS CO., TOKYO
RESEARCH LAB. Modification of the Iodimetric Titration	BRANCH AGRICULTURAL EXPERIMENT STATION.	(JAPAN). Improved Design of Distribution Networks by
Method for the Determination of Bromide and	Effects of Antitranspirants on Yield of Grain	Minimum Route,
Its Application to Mixed Domestic-Industrial	Sorghum Under Limited Irrigation,	W75-11175 4A
Waste Effluents,	W75-10858 3F	
W75-11341 5A	NEW MENTOO OF AMERICAN TANKERSON	NIHON UNIV., TOKYO (JAPAN). DEPT. OF
NATIONAL INST. FOR WATER RESEARCH	NEW MEXICO STATE UNIV., UNIVERSITY PARK. DEPT. OF HORTICULTURE.	FISHERIES.
NATIONAL INST. FOR WATER RESEARCH, PRETORIA (SOUTH AFRICA).	Water Application Practices and Landscape At-	Some Observations on Behavior of the Treated
Desirable Provision in Current Designs for Fu-	tributes Associated with Residential Water	Sewage Disposed in the Sea,
ture Development in Relation to Reclamation	Consumption,	W75-11020 5B
of Effluent,	W75-11059 3D	NL INDUSTRIES, INC., HOUSTON, TEX.
W75-10980 5D	NEW MENTO UNIV. AT BUOLEROUP BERT	BAROID DIV.
	NEW MEXICO UNIV., ALBUQUERQUE. DEPT. OF BIOLOGY.	Tests Show Potassium Mud Versatility,
Drug Resistant Coliforms Call for Re-Evalua-	Man's Impact on a Newly Formed Reservoir,	W75-11284 8G
tion of Water Quality Standards, W75-11130 5B	W75-11233 5C	NORTH CAROLINA STATE UNIV., RALEIGH.
W/3-11130		DEPT. OF CHEMICAL ENGINEERING.
South African Eutrophication Problems: A Per-	NEW ORLEANS UNIV., LA. DEPT. OF	Solute-Solute Interactions in Ultrafiltration
spective,	BIOLOGICAL SCIENCES. Epifaunal Invertebrates as Indicators of Water	Treatment of Paper Mill Wastes,
W75-11131 5C	Quality in Southern Lake Pontchartain,	W75-11334 5D
NATIONAL INST. OF RADIOLOGICAL	W75-10852 5C	
SCIENCES, CHIBA (JAPAN). DEPT. OF		NORTH CAROLINA STATE UNIV., RALEIGH.
ENVIRONMENTAL CONTAMINATION.	NEW SOUTH WALES DEPT. OF PUBLIC	DEPT. OF CIVIL ENGINEERING. Implicit Numerical Modeling of Unsteady
A Field Study of Physico-Chemical States of	WORKS, SYDNEY (AUSTRALIA). WATER	Flows,
Artificial Radionuclides in Seawater,	SUPPLY AND SEWERAGE BRANCH. Australian Arid Zone Streangauging,	W75-10925 8B
W75-11022 5B	W75-11307 2E	
NATIONAL INST. OF RADIOLOGICAL	W/3-1130/	Management of Retardation of Salt Water In-
SCIENCES, CHIBA (JAPAN). DIV. OF	NEW SOUTH WALES UNIV., KENSINGTON	trusion in Coastal Aquifers,
TRAINING SCHOOLS.	(AUSTRALIA). DEPT. OF CIVIL	W75-11058 2F
Retention of Cadmium in Mice Studied by	ENGINEERING.	NORTHERN FOREST RESEARCH CENTER,
Whole Body Autoradiography,	Problems of Liquid Waste Disposal, W75-11112 5G	EDMONTON (ALBERTA).
W75-11024 5A	W/3-11112	Specific Conductance Method for in Situ Esti-
NATIONAL MARINE FISHERIES SERVICE,	NEW SOUTH WALES UNIV., KENSINGTON	mation of Total Dissolved Solids,
PANAMA CITY, FLA. GULF COASTAL	(AUSTRALIA). SCHOOL OF CIVIL	W75-11167 5A
FISHERIES CENTER.	ENGINEERING.	OAK BIDGE NATIONAL LAB TENN
A Survey of Fishes and Commercial Inver-	Multilag Markov Models for Eastern Australian	OAK RIDGE NATIONAL LAB., TENN. Chlorine-Containing Organic Constituents in
tebrates of the Nearshore and Estuarine Zone	Streams, W75-11301 2E	Chlorinated Effluents,
Between Cape Romano and Cape Sable,	W 75-11501	W75-10970 5D
Florida,	Droughts, Distributions and Dependence: An	A CONTRACT OF THE PARTY OF THE
W75-11189 2I	Analysis of Some Synthetic Data Generation	Calcium Sulfate Solubility in Brackish Water
NATIONAL RESEARCH COUNCIL,	Methods, W75-11305 2E	Concentrates and Applications to Reverse Os-
WASHINGTON, D.C. COMMITTEE ON	W/3-11303	mosis Processes: Polyphosphate Additives,
JOJOBA UTILIZATION.	Difficulties in Gauging Small Catchments - A	W75-11004 5D
Products from Jojoba: A Promising New Crop	Case Study,	Status of Waste Heat Utilization and Dual-Pur-
for Arid Lands.	W75-11306 2E	pose Plant Projects,
W75-10890 3F	NEW SOUTH WALES UNIV., KENSINGTON	W75-11251 3E
NATIONAL TAIWAN UNIV., TAIPEI.	(AUSTRALIA). SCHOOL OF WOOL AND	OPPLOY OF THE CHIPP OF PACINFERS
HYDRAULIC LAB.	PASTORAL SCIENCES.	OFFICE OF THE CHIEF OF ENGINEERS (ARMY), WASHINGTON, D.C.
Ground Water Depletion and Subsidence	Some Observations on Rainfall in Western	Registration of Aquatic Herbicides,
Problems in Taipei Basin,	New South Wales,	W75-11212 4A
W75-11262 4B	W75-11304 2B	Assessment and a literature of the procedured
NATIONAL WATER COUNCIL, LONDON	NEW YORK AQUARIUM, BROOKLYN.	OFFICE OF WATER RESEARCH AND
(ENGLAND).	OSBORN LABS. OF MARINE SCIENCES.	TECHNOLOGY, WASHINGTON, D.C.
The Water Industry in Transition,	The Role of Planktonic Protozoa in the Marine	Membrane Desalting Gets Big Push,
W75-11252 3E	Food Chain. Seasonal Changes, Relative	W75-10982 3A
NEVADA UNIV., RENO. DESERT RESEARCH	Abundance, and Cell Size Distribution of Tin-	OKLAHOMA STATE UNIV., STILLWATER.
INST.	tinnida, W75-11191 5C	DEPT. OF AGRICULTURAL ENGINEERING.
Time-Variant Characteristics of Selected	W/3-11191	Wind Effects on Chemical Films for Evapora
Wastewater Treatment Plants of Nevada,	NEW YORK STATE COLL. OF AGRICULTURE	tion Suppression at Lake Hefner,
W75-11245 5D	AND LIFE SCIENCES, ITHACA, N.Y.	W75-10920 3E
NEW MEYICO INCT. OF MINING AND	ECOLOGY AND SYSTEMATICS SECTION.	Improved Design and Operating Criteria for
NEW MEXICO INST. OF MINING AND	Utilization of Stream-Borne Phosphorus by	Rural Water Districts,
TECHNOLOGY, SOCORRO. Derivation of Surface Water Lag Time for Con-	Cayuga Lake Phytoplankton, W75-11036 5C	W75-11056 6I
verging Overland Flow,	W 75-11030 SC	
W75-11156 2E	NEW YORK STATE DEPT. OF	OKLAHOMA STATE UNIV., STILLWATER.
	ENVIRONMENTAL CONSERVATION,	SCHOOL OF MECHANICAL AND AEROSPACE
Approximation for Steady Interface Beneath a	ALBANY. DIV. OF AIR RESOURCES.	ENGINEERING.
Well Pumping Fresh Water Overlying Salt	Evidence of Atmospheric Transport of Ozone	Hydraulic Modeling of Mixing Phenomena is
Water, W75-11255 4B	into Urban Areas, W75-11169 5A	Stratified Lakes, W75-11043 2F

by A

ed 5B

8G
H.
sion
DH.
ady
BB
In2F

5A
s in
5D
/ater
Os5D
-Pur3E

4A

3A

R. G. apora-

3B
ia for
6D
R.
PACE
ena in

2H

OKLAHOMA UNIV., NORMAN.	POLYTECHNIC INSTITUTE OF NEW YORK,	RUTGERS - THE STATE UNIV., NEW
A Mathematical Model for Optimal Waste	BROOKLYN; AND ILLINOIS UNIV.,	BRUNSWICK, N.J.
Load Allocations, W75-11102 5G	CHICAGO. Computer Systems and Water Resources,	The Water Quality and Bottom Sediment Characteristics of New Jersey Lagoon
OKLAHOMA UNIV., NORMAN. DEPT. OF CIVIL ENGINEERING AND ENVIRONMENTAL	W75-11174 6A	Developments, W75-11104 5B
SCIENCE.	POWER REACTOR AND NUCLEAR FUEL	CALEODD HAIR! (ENGLAND)
Deprivation Contribution and Interference Ef-	DEVELOPMENT CORP., TOKYO (JAPAN). RAW MATERIALS DIV.	SALFORD UNIV. (ENGLAND). On-Site Hypochlorite Generation,
fects of Multiple Wells in a Common Aquifer,	Uranium Mineralization by Ground Water in	W75-11109 5D
W75-11142 4B	Sedimentary Rocks, Japan.	
OMAHA METROPOLITAN UTILITIES	W75-11145 2F	SALISBURY CITY ENGINEER'S DEPT. (RHODESIA).
DISTRICT, NEBR. SERVICES DEPT.	PRINCE GEORGE CITY ENGINEER'S OFFICE	Chemical-Biological Treatment With Biological
Distribution-System Operation Analysis Model, W75-11180 5D	(BRITISH COLUMBIA).	Filters,
The second secon	Horizontal Groundwater Collectors, 'Canada's	W75-11123 5D
OREGON STATE UNIV., CORVALLIS. DEPT.	Largest Water Well', W75-10999 8B	SANDIA LABS., ALBUQUERQUE, N. MEX.
OF CIVIL ENGINEERING. Strategic Approach to Estuarine Environmental		Drilling Rate Affects Costs More than Bit Life,
Management,	QUEENSLAND UNIV., BRISBANE (AUSTRALIA). DEPT. OF ZOOLOGY.	W75-11279 8C
W75-11179 2L	Quantitative Estimation of the Daily Ingestion	SASKATCHEWAN UNIV., SASKATOON. DEPT.
OREGON STATE UNIV., CORVALLIS.	of Phytoplankton by Tilapia Nilotica and	OF SOIL SCIENCE.
SCHOOL OF FORESTRY.	Haplochromis Nigripinnis in Lake George,	Soil Morphology and Soil Physical Properties:
Dissipation of Residues of Phenoxy Herbicides	Uganda,	II. Mechanical Impedance and Moisture Reten-
Applied to the Watershed,	W75-11268 2H	tion and Movement, W75-10885 2G
W75-11213 5B	RAND CORP., SANTA MONICA, CALIF.	
OREGON STATE UNIV., CORVALLIS.	A Three-Dimensional Model for Estuaries and	SEATTLE DEPT. OF WATER, WASH.
SCHOOL OF OCEANOGRAPHY.	Coastal Seas: Vol. II, Aspects of Computation,	Algae Control in Northwest Reservoirs,
Near-Bottom Chemistry in the Eastern Pacific and North Atlantic Oceans.	W75-10900 2L	W75-11231 5G
W75-10923 2K	RENSSELAER POLYTECHNIC INST., TROY,	SENATE, WASHINGTON, D.C.
	N.Y. DEPT. OF CHEMICAL ENGINEERING;	The Responsibility of U.S. Water Suppliers,
A Reevaluation of the Combined Effects of Temperature and Salinity on Survival and	AND RENSSELAER POLYTECHNIC INST., TROY, N.Y. DEPT. OF ENVIRONMENTAL	W75-10856 5G
Growth of Bivalve Larvae Using Response	ENGINEERING.	SHEFFIELD WATER POLLUTION CONTROL
Surface Techniques,	Total Waste Recycle System for Water Purifi-	DEPT. (ENGLAND).
W75-11081 5C	cation Plant Using Alum as Primary Coagulant,	Some Studies on Nitrification in the Activated
OTAGO UNIV., DUNEDIN (NEW ZEALAND).	W75-11094 · 5D	Sludge Process, W75-10961 5D
DEPT. OF GEOLOGY.	RENSSELAER POLYTECHNIC INST., TROY,	
Mass-Emplaced Sand-Fingers at Mararoa Con-	N.Y. FRESH WATER INST:	SHELL OIL CO., HOUSTON, TEX.
struction Site, Southern New Zealand, W75-11161 2J	Freshwater Ecosystem Research in Water	Analysis of Factors Influencing Mobility and Adsorption in the Flow of Polymer Solution
	Quality Management, W75-11012 6G	Through Porous Media,
OXY METAL FINISHING CORP., MADISON HEIGHTS, MICH.		W75-11275 8B
Upgrading Metal-Finishing Facilities to Reduce	RESOURCES FOR THE FUTURE, INC., WASHINGTON, D.C.	SHIMONOSEKI UNIV. OF FISHERIES (JAPAN).
Pollution. (Part 1). In-Process Pollution Abate-	Interbasin Water Transfers: A Case Study in	The Influence of the Warm Cooling Water from
ment,	Mexico,	a Fossil Fueled Power Plant on Oceanographic
W75-11324 5D	W75-10879 4A	Conditions and Composition of Plankton in
PAPIERFABRIK BIBERIST (SWITZERLAND).	RHODE ISLAND UNIV., KINGSTON. DEPT. OF	Owase Bay I. Water Temperature in Relation to Distribution of Microplankton, (In Japanese),
Possibilities of Reutilization of Kaolin from	CIVIL AND ENVIRONMENTAL	W75-11030 5C
Biological Waste Water Sludges (Moeglichkeiten der Wiederverwertung von	ENGINEERING.	CHOWN MOUNT AINS PAGE PROPERTY COST
Kaolin aus biologischen Abwasserchlaemmen),	Physiochemical Treatment of Wastewater-Sea- water Mixture by Electrolysis,	SNOWY MOUNTAINS ENGINEERING CORP., CANBERRA (AUSTRALIA).
W75-11349 5D	W75-10979 5D	Hydrologic Investigation and Design of Urban
PENNSYLVANIA STATE UNIV., UNIVERSITY		Stormwater Drainage Systems,
PARK. SCHOOL OF FORESTRY.	RHODE ISLAND UNIV., KINGSTON. GRADUATE SCHOOL OF OCEANOGRAPHY.	W75-11141 4A
Dissipation of Phenoxy Herbicides Applied to	Copper Toxicity in Busycon Canaliculatum L.,	SOUTH AUSTRALIA DEPT. OF
Riparian Vegetation, W75-11214 5B	W75-11031 5C	AGRICULTURE, ADELAIDE.
	DICE UNIV. HOUSTON MEN	The Early Vegetative Growth of Two Annual
PETROTECH LTD., LONDON (ENGLAND).	RICE UNIV., HOUSTON, TEX. Theory of Plasticity of Porous Media with	Pasture Grasses (Hordeum Leporinum Link and Lolium Rigidum Gaud.).
Dissolved Gases Are Key Corrosion Culprits,	Fluid Flow,	and Lolium Rigidum Gaud.), W75-10876 3F
W75-11274 8G	W75-11276 8E	
PITTSBURGH UNIV., PA. DEPT. OF CIVIL	RIKE SERVICE, NEW ORLEANS, LA.	The Influence of Density and Nitrogen on the
ENGINEERING. Wastewater Treatment Plant Odors: A Continu-	How to Make Squeeze Cementing Successful,	Outcome of Competition Between Two Annual Pasture Grasses (Hordeum Leporinum Link
ing Enigma,	W75-11286 8F	and Lolium Rigidum Gaud.),
W75-10986 5D	BONAT UNIN OF MALES WALLED	W75-10889 3F
POLLUTION CONTROL, INC., SOUTH BARRE,	ROYAL UNIV. OF MALTA, VALLETTA. DEPT. OF CHEMISTRY.	The Germination and Establishment of Two
VT. (ASSIGNEE)	The Role of Endogenous Abscisic Acid in the	Annual Pasture Grasses (Hordeum Leporinum
Low Temperature Water Purification System.	Response of Plants to Stress,	Link and Lolium Rigidum Gaud.),
W75-11074 5F	W75-11319 3F	W75-10897 21

SPRINGFIELD DEPT. OF WATER, LIGHT AND POWER, ILL.	TENNESSEE VALLEY AUTHORITY, MUSCLE SHOALS, ALA.	TUSKEGEE INST., ALA. SCHOOL OF APPLIED SCIENCES.
Computer Analysis of Water-Distribution	Dissipation of Residues of Phenoxy Herbicides	Solid Wastes, Animal Refuse, and Organic
Systems,	Applied for Water Milfoil Control in Large	Residues Disposal, and the Quality of Ground
W75-11182 4A	Reservoirs, W75-11198 5B	Water,
STANFORD UNIV., CALIF. DEPT. OF CIVIL	W /3-11196	W75-11244 5B
ENGINEERING. Two-Dimensional, Hydrostatic Simulation of	TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF BIOCHEMISTRY AND BIOPHYSICS.	UHDE (FRIEDRICH) G.M.B.H., DORTMUND (WEST GERMANY).
Thermally-Influenced Hydrodynamic Flows,	Biomagnification of Dieldrin Residues by Food	The Economy of Various Methods for De-
W75-10901 2H	Chain Transfer from Clams to Blue Crabs	watering Sludge From Biological Purification
	Under Controllled Conditions, W75-11135 5C	(Ueber die Wirtschaftlichkeit verschiedener
STATE UNIV. COLL., FREDONIA, N.Y. DEPT. OF BIOLOGY.	W/3-11133	Verfahren zur Entwaesserung von
Root: Shoot and Leaf Area Relationships of	TEXAS PARKS AND WILDLIFE DEPT., SAN	biologischem Klaerschlamm),
Macrophyte Communities in Chautauqua Lake,	ANTONIO. STATEWIDE NOXIOUS	W75-11127 5D
New York,	VEGETATION CONTROL PROGRAM. Integrated Controls on Noxious Aquatic Plants,	UNIVERSITY COLL., DUBLIN, (IRELAND).
W75-11009 5C	W75-11204 5G	DEPT. OF CIVIL ENGINEERING.
STATE UNIV. OF NEW YORK, BUFFALO.	TEVAC TECH INW. LUBBOCK	The Nature and Components of the Hydrologi-
The Kinetics of Crystallization of Scale-Form-	TEXAS TECH UNIV., LUBBOCK. Stabilization and Reconstruction of Texas	cal Cycle, W75-10864 2A
ing Minerals,	Coastal Foredunes with Vegetation,	W 73-10004
W75-11273 8G	W75-10887 2L	UNIVERSITY COLL. OF ENGINEERING,
STATE UNIV. OF NEW YORK STONY BROOK.	TEVACUMIN AT DALL AC DIGHT BROOM	BURLA (INDIA). DEPT. OF CIVIL
MARINE SCIENCES RESEARCH CENTER.	TEXAS UNIV. AT DALLAS, RICHARDSON. INST. FOR ENVIRONMENTAL SCIENCES.	ENGINEERING. Application of Electrical Analogy to Draw
Surface Tension Reductions and Urban Wastes	Dissolved Gas Supersaturation and Dilution in	Flow Nets for Sudden Drawdown Conditions in
in The New York Bight,	Thermal Plumes from Steam Electric Generat-	Earth Dams,
W75-10927 5B	ing Stations,	W75-11143 8B
STIRLING UNIV. (SCOTLAND). DEPT. OF	W75-11159 5B	UNIVERSITY OF NEW ENGLAND, ARMIDALE
BIOLOGY.	THAMES WATER AUTHORITY, LONDON	(AUSTRALIA). DEPT. OF GEOGRAPHY.
Some Effects of Copper on the Polychaete	(ENGLAND).	Aspects of Rainfall Measurement in a New En-
Phyllodoce Maculata, W75-11136 5C	A New Look at Pollution Prevention on Lowland Rivers.	gland Location,
7771130	W75-11132 5G	W75-11309 2B
STONE AND WEBSTER ENGINEERING CORP.,		UNIVERSITY OF NEW ENGLAND, ARMIDALE
DENVER, COLO. Turbulent Structure Near Smooth Boundary,	TOTTORI UNIV. (JAPAN). DEPT. OF	(AUSTRALIA). SCHOOL OF NATURAL
W75-11148 8B	FORESTRY MANAGEMENT. Studies on the Relationship Between Dry-	RESOURCES.
11/2/1140	Matter Production and the Development of a	Generation of Arid Zone Rainfall and Runoff,
SWISS FEDERAL INST. FOR SNOW AND	Pine Forest on Coastal Sand Dunes (1), (In	W75-11303 2A
AVALANCHE RESEARCH, DAVOS- WEISSFLUHJOCH.	Japanese),	UNIVERSITY OF SOUTHWESTERN
Subsurface Flow from Snowmelt Traced by	W75-11098 4A	LOUISIANA, LAFAYETTE. DEPT. OF PLANT
Tritium,	TOTTORI UNIV. (JAPAN). SAND DUNE	INDUSTRY. Field Testing of Aquatic Herbicides for Control
W75-10921 2F	RESEARCH INST.	of Egeria Densa,
TASMANIAN DEPT. OF THE ENVIRONMENT,	Cultivation of Netted Melon By Use of Trickle Irrigation in a Sand Field Plastic Greenhouse,	W75-11200 5G
HOBART (AUSTRALIA).	(In Japanese),	LIBROAT A LIMITY (PURENCE ALCAT ACCAY
Uptake of Cadmium, Zinc, Copper, Lead and	W75-11095 3F	UPPSALA UNIV. (SWEDEN). ALGAL ASSAY LAB.
Chromium in the Pacific Oyster, Crassostrea	Nozzle Hydraulics in the Trickle Irrigation	Minitest Method for Monitoring Effluent Quali-
Gigas, Grown in the Tamar River, Tasmania, W75-11086 5B	SystemRelation Between Water Temperature	ty,
	and Nozzle Flow Rate (In Japanese),	W75-10994 5E
TECHNION - ISRAEL INST. OF TECH., HAIFA.	W75-11096 3F	UTAH STATE UNIV., LOGAN. DEPT. OF CIVIL
The Mechanism of Flocculation Processes in the Presence of Humic Stubtances.	Practical Application of Surface Fixed-System	AND ENVIRONMENTAL ENGINEERING.
W75-10958 5D	for Multi-Purpose Sprinkler Irrigation Uses, (In	Process Studies and Modeling of Self-Cleaning
	Japanese), W75-11097 3F	Capacity of Mountain Creeks for Recreation
TECHNION - ISRAEL INST. OF TECH. HAIFA		Planning and Management, W75-11055 5E
(ISRAEL). DEPT. OF AGRICULTURAL ENGINEERING.	TROMSO UNIV. (NORWAY). INST. OF	117511055
Human Obstacles to the Control of the	BIOLOGY AND GEOLOGY. The Effects of Crude Oils and the Dispersant	UTAH STATE UNIV., LOGAN. INST. FOR
Hydrological Cycle for the Benefit of Man,	Corexit 8666 on Sea Urchin Gametes and Emb-	SOCIAL SCIENCE RESEARCH ON NATURAL
W75-10866 2A	ryos,	RESOURCES. Social Impacts of Water Resources Develop
TEKMAR CO., CINCINNATI, OHIO.	W75-11090 5C	ments and Their Implication for Urban and
Apparatus for Concentration of Volatile Or-	The Effects of Oil Dispersants on the Cell in	Rural Development: A Post Audit Analysis o
ganic Pollutants in Water,	Fertilization and Development,	the Weber Basin Project in Utah,
W75-11342 5A	W75-11091 5C	W75-10854 61
TENNESSEE UNIV., KNOXVILLE. COLL. OF	TULSA UNIV., OKLA. DEPT. OF EARTH	UTAH STATE UNIV., LOGAN. WATERSHED
ENGINEERING.	SCIENCES.	SCIENCE UNIT.
Laboratory Investigation of One-Dimensional	Review of Conference on Hydrology of Deep	Approximate Annual Water Budgets of Two
Wave Motion in Open Channels, W75-11172 8B	Sedimentary Basins, W75-10935 5B	Chained Pinyon-Juniper Sites, W75-10896

VANDERBILT UNIV., NASHVILLE, TENN. DEPT. OF GEOLOGY.	WATERLOO UNIV. (ONTARIO), DEPT. OF MECHANICAL ENGINEERING.
A Study of Factors Controlling the Chemical Quality of Water in Cartwright Creek Basin.	
Williamson County, Tennessee, W75-11164 2K	W75-11166 2B
	WATTS REGULATOR CO., LAWRENCE,
VAST (J.) ASSOCIATES, INC., NEW YORK. (ASSIGNEE)	MASS. Preventing Backflow in Piping Cross Connec-
System for Softening and Dealkalizing Water by Electrodialysis,	W75-11018 5B
W75-11065 SF	WHEELABRATOR-FRYE INC., NEW YORK.
VATTENBYGGNADSBYRAN LTD., STOCKHOLM (SWEDEN).	(ASSIGNEE) Flocculation Device for Waste Fluid Treat
Nitrogen Removal in a Pilot Plant, W75-10984 5D	ment, W75-11077 5E
VATTENBYGGNADSBYRAN LTD.,	WIGGINS-RIMER AND ASSOCIATES,
STOCKHOLM (SWEDEN). WATER AND ENVIRONMENTAL DIV.	DURHAM, N.C. Preserving Activated Sludge,
Underground Wastewater Treatment Plants,	W75-10962 5I
W75-10974 5I	WISCONSIN UNIV., MADISON. DEPT. OF
VICTORIA STATE COLL., CARLTON (AUSTRALIA). DEPT. OF PLANT	CIVIL AND ENVIRONMENTAL ENGINEERING.
PHYSIOLOGY. The Aquatic Weed Problem. 1. Identification,	Treatment Plant Monitoring Programs: A Preliminary Analysis,
	N75-11176 51
VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF FISHERIES	WISCONSIN UNIV., MADISON. DEPT. OF SOII SCIENCE.
AND WILDLIFE SCIENCES. Aquatic Plant Control Using Herbicides in	Concurrent Nitrification-Denitrification at that Sediment-Water Interface as a Mechanism for
Large Potable Water Supply,	Nitrogen Losses from Lakes, W75-10902 56
VIRGINIA STATE WATER CONTROL BOARD	
RICHMOND. Simulation of Water Quality Management Pol	CENTER; AND WISCONSIN UNIV., MADISON DEPT. OF AGRICULTURAL JOURNALISM.
cies, W75-11181 50	Information as a Regulatory Tool in Water G Quality Control,
WARSAW UNIV. (POLAND). DEPT. OF	W75-10903 50
HYDROBIOLOGY. Experimentally Increased Fish Stock in th	WISCONSIN UNIV., MADISON. LIBRARY BE SCHOOL.
Pond Type Lake Warniak. IV. Feeding of Introduced and Autochthonous Non-Predator	
Fish,	Wisconsin Department of Natural Resources,
	C W75-10899 10
WASHINGTON UNIV., SEATTLE. COLL. OF FOREST RESOURCES.	WISCONSIN UNIV., MADISON. WATER RESOURCES CENTER.
Evapotranspiration of Four Forest Types Mes sured With the Eddy Correlation Technique,	 Extraction and Analytical Techniques for Pest cides in Soil, Sediment, and Water,
	D W75-11236 5
WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOGRAPHY.	WISCONSIN UNIV., MILWAUKEE. CENTER FOR GREAT LAKES STUDIES.
The Geochemical Cycle of Arsenic in Lab	ke Investigation of the Influence of Therm
Washington and its Relation to Other Element W75-10922 5	s, Discharge from a Large Electric Power Station B on the Temperature and Near-Shore Circul
Ammonia Excretion by Zooplankton and i	
Significance to Primary Productivity Durin Summer,	WISCONSIN UNIV., MILWAUKEE. DEPT. OF
	C GEOGRAPHY. Denudation Studies: Can We Assume Stream
WASHINGTON UNIV., SEATTLE. SCHOOL OF	F Steady State, W75-11154
Management of Salinity,	WRIGHT WATER ENGINEERS, INC.,
	G DENVER, COLO. Colorado City Solves Its Sand Pumpii
WATERLOO UNIV. (ONTARIO). DEPT. OF BIOLOGY.	Problems, W75-11261 8
The Effects of Experimental Blackfly (Dipter	a:
Simuliidae) Larviciding with Abate, Dursba and Methoxychlor on Stream Invertebrates, W75-11157 5	n, WYOMING UNIV., LARAMIE. WATER RESOURCES RESEARCH INST. Water Resource Observatory Climatologic
#15-11157	Data, Water Year 1973.

W75-11035

A

W

BB .E En-2B LE

f, 2A

T 5G i vuali5D IVIL aning eation
5B

velopn and vsis of

ED Two

4A

WYZSZA SZKOLA ROLNICZA, SZCZECIN (POLAND). DEPT. OF HYDROZOOLOGY. Use of Steelon-Net Veils for Protection of the Hydro-Engineering Works Against Dreissena Polymorphia Pall, W75-11033 YALE UNIV., NEW HAVEN, CONN. SCHOOL OF FORESTRY. Vegetation, Soil, and Climate on the Green Mountains of Vermont, W75-11021 21 YORK UNIV., DOWNSVIEW (ONTARIO). DEPT. OF BIOLOGY. An Investigation of Glycolate Excretion in Two Species of Blue-Green Algae, W75-11230 5C YULE, JORDAN AND ASSOCIATES, CAMP HILL, PA. ENVIRONMENTAL ENGINEERING DIV. How Silica Affects Iron Removal from Groundwater, W75-11016 ZIMPRO, INC., ROTHSCHILD, WIS. IMPRO, INC., ROTHSCHILD, 18 A., Carbon Regeneration by Wet Air Oxidation, 5D

7C

1 (2)

19

.

The state of the s

and the second

THE RESERVE TO SERVE THE PARTY OF THE PARTY

Top of the part of the same of

The last of the la

-1

Lance Liver and the same

The state of the s

The state of the s

150.00 10

ACCESSION NUMBER INDEX

W75-10851	6B	W75-10929	4A	W75-11007	5G	W75-11085	5B
W75-10852	5C	W75-10930	2F	W75-11008	5G	W75-11086	5B
W75-10853	3F	W75-10931	2E	W75-11009	5C	W75-11087	5C
W75-10854	6B	W75-10932	5B	W75-11010	5F	W75-11088	5C
W75-10855	5B	W75-10933	2E	W75-11011	5B	W75-11089	5B
W75-10856	5G	W75-10934	5B	W75-11012	6G	W75-11090	5C
W75-10857	5G	W75-10935	5B	W75-11013	5F	W75-11091	5C
W75-10858	3F	W75-10936	5B	W75-11014	5D	W75-11092	5G
W75-10859	5G	W75-10937	2K	W75-11015	5F	W75-11093	8B
W75-10860	2C	W75-10938	4A	W75-11016	5F	W75-11094	5D
W75-10861	4A	W75-10939	2E	W75-11017	5D	W75-11095	3F
W75-10862	21	W75-10940	2F	W75-11018	5B	W75-11096	3F
W75-10863	2A	W75-10941	20	W75-11019	5B	W75-11097	3F
W75-10864	2A	W75-10942	3B 2J	W75-11020	5B	W75-11098	4A
W75-10865	2A	W75-10943	ar.	W75-11021	21	W75-11099	3F
W75-10866	2A	W75-10944		W75-11022	5B	W75-11100	4D
W75-10867	6B	W75-10945	7C 7C	W75-11022	5G	W75-11101	5D
W75-10868	2G	W75-10946	7C	W75-11023	5A	W75-11101	5G
W75-10869	4C	W75-10947	7C	W75-11024	5C	W75-11102	5D
W75-10870	4D	W75-10948	7C	W75-11025	5C	W75-11103	5B
W75-10871	4A						5B
	4B	W75-10949	7C	W75-11027	5C	W75-11105	
W75-10872		W75-10950	7C	W75-11028	5C	W75-11106	3F
W75-10873	2G	W75-10951	7C	W75-11029	5B	W75-11107	5D
W75-10874	3F	W75-10952	7C	W75-11030	5C	W75-11108	5D
W75-10875	3F	W75-10953	7C	W75-11031	5C	W75-11109	5D
W75-10876	3F	W75-10954	7C	W75-11032	5C	W75-11110	5D
W75-10877	2G	W75-10955	5D	W75-11033	5G	W75-11111	8C
W75-10878	2G	W75-10956	5D	W75-11034	5C	W75-11112	5G
W75-10879	4A	W75-10957	5D	W75-11035	7C	W75-11113	5D
W75-10880	2H	W75-10958	5D	W75-11036	5C	W75-11114	5D
W75-10881	2J	W75-10959	5D	W75-11037	6F	W75-11115	5D
W75-10882	4A	W75-10960	5D	W75-11038	6F	W75-11116	5D
W75-10883	5A	W75-10961	5D	W75-11039	5B	W75-11117	5D
W75-10884	2J	W75-10962	5D	W75-11040	2B	W75-11118	5D
W75-10885	2G	W75-10963	5D	W75-11041	5D	W75-11119	5F
W75-10886	3B	W75-10964	5D	W75-11042	2F	W75-11120	5D
W75-10887	2L	W75-10965	5D	W75-11043	2H	W75-11121	5D
W75-10888	3F	W75-10966	5D	W75-11044	2D	W75-11122	5D
W75-10889	3F	W75-10967	5D	W75-11045	3F	W75-11123	5D
W75-10890	3F	W75-10968	5D	W75-11046	5C	W75-11124	5D
W75-10891	2Н	W75-10969	5D	W75-11047	5G	W75-11125	5B
W75-10892	4D	W75-10970	5D	W75-11048	3F	W75-11126	5D
W75-10893	5C	W75-10971	5D	W75-11049	4A	W75-11127	5D
W75-10894	2K	W75-10972	5D	W75-11050	10B	W75-11128	5D
W75-10895	5B	W75-10973	5D	W75-11051	5C	W75-11129	4A
W75-10896	4A	W75-10974	5D	W75-11052	5C	W75-11130	5B
W75-10897	21	W75-10975	5D	W75-11053	5A	W75-11131	5C
W75-10898	6E	W75-10976	5D	W75-11054	2G	W75-11132	5G
W75-10899	10C	W75-10977	5D	W75-11055	5B	W75-11133	5D
W75-10900	2L	W75-10978	5D	W75-11056	6D	W75-11134	5D
W75-10901	2H	W75-10979	5D	W75-11057	8B	W75-11135	5C
W75-10902	5C	W75-10980	5D	W75-11058	2F	W75-11136	5C
W75-10903	5G	W75-10981	5D	W75-11059	3D	W75-11137	5B
W75-10904	5B	W75-10982	3A	W75-11060	6F	W75-11138	7C
W75-10905	21	W75-10983	5G	W75-11061	4A	W75-11139	4A
W75-10906	6F	W75-10984	5D	W75-11062	5F	W75-11140	2G
W75-10907	5F	W75-10985	5D	W75-11063	5A	W75-11141	4A
W75-10908	2H	W75-10986	5D	W75-11064	5D	W75-11142	4B
W75-10909	5B	W75-10987	5G	W75-11065	5F	W75-11143	8B
W75-10910	8G	W75-10988	5D	W75-11066	5D	W75-11144	2L.
W75-10911	7C	W75-10989	5D	W75-11067	5D	W75-11145	2F
W75-10912	7C	W75-10990	5F	W75-11068	3A	W75-11146	7B
W75-10913	7C	W75-10991	5D	W75-11069	5D	W75-11147	8B
W75-10914	7C	W75-10992	5D	W75-11070	3A	W75-11148	8B
W75-10915	7C	W75-10993	5D	W75-11071	5G	W75-11149	8B
W75-10916	3F	W75-10994	5D	W75-11072	5F	W75-11150	8B
W75-10917	2E	W75-10995	5A	W75-11073	5D	W75-11151	8B
W75-10918	21	W75-10996	4A	W75-11074	5F	W75-11152	8B
W75-10919	7B	W75-10997	2L.	W75-11075	8A	W75-11153	2J
W75-10920	3B	W75-10998	8B	W75-11076	5D	W75-11154	21
W75-10921	2F	W75-10999	8B	W75-11077	5D	W75-11155	2C
W75-10922	5B	W75-11000	6G	W75-11078	5A	W75-11156	2E
W75-10923	2K	W75-11001	5G	W75-11079	5A	W75-11157	5C
W75-10924	8D	W75-11002	8C	W75-11080	5C	W75-11158	5B
W75-10925	8B	W75-11003	5G	W75-11081	5C	W75-11159	5B
W75-10926	3F	W75-11004	5D	W75-11082	5B	W75-11160	5B
W75-10927	5B	W75-11005	5F	W75-11083	5B	W75-11161	21
W75-10928	5A	W75-11006	21	W75-11084	5C	W75-11162	2J

W75-11163

11/26 11162	21	W75-11242	6E	
W75-11163	23		5B	
W75-11164	2K	W75-11243		
W75-11165	5A	W75-11244	5B	
W75-11166	2B	W75-11245	5D	
W75-11167	5A	W75-11246	5G	
W75-11168	2B	W75-11247	5G	
W75-11169	5A	W75-11248	6C	
W75-11170	5B	W75-11249	5G	
W75-11171	5B	W75-11250	5G	
			3E	
W75-11172	8B	W75-11251		
W75-11173	5D	W75-11252	3E	
W75-11174	6A	W75-11253	6B	
W75-11175	4A	W75-11254	5G	
W75-11176	5D	W75-11255	4B	
W75-11177	5G	W75-11256	5C	
W75-11178	4A	W75-11257	8C	
W75-11179	2L	W75-11258	8C	
W75-11180	5D	W75-11259	8G	
W75-11181	5G	W75-11260	8G	
W75-11182	4A	W75-11261	8C	
W75-11183	4A	W75-11262	4B	
W75-11184	5F	W75-11263	8C	
W75-11185	4A	W75-11264	8C	
W75-11186	4A	W75-11265	5C	
W75-11187	5C	W75-11266	5C	
W75-11188	5C	W75-11267	5G	
		W75-11268	2H	
W75-11189	21			
W75-11190	5C	W75-11269	8B	
W75-11191	5C	W75-11270	8C	
W75-11192	5G	W75-11271	8G	
W75-11193	5G	W75-11272	8E	
W75-11194	5G	W75-11273	8G	
W75-11195	4A	W75-11274	8G	
W75-11196	5G	W75-11275	8B	
W75-11197		W75-11276	8E	
	5G		8F	
W75-11198	5B	W75-11277		
W75-11199	5G	W75-11278	8F	
W75-11200	5G	W75-11279	8C	
W75-11201	5G	W75-11280	4B	
W75-11202	5G	W75-11281	8G	
W75-11203	4A	W75-11282	8G	
W75-11204	5G	W75-11283	8C	
W75-11205	5C	W75-11284	8G	
		W75-11285	8G	
W75-11206	5G			
W75-11207	4A	W75-11286	8F	
W75-11208	5A	W75-11287	8C	
W75-11209	5G	W75-11288	7C	
W75-11210	4A	W75-11289	4B	
W75-11211	5C	W75-11290	4B	
W75-11212	4A	W75-11291	8F	
W75-11213	5B	W75-11292	8G	
W75-11214	5B	W75-11293	8F	
W75-11215	5G	W75-11294	8G	
		W75-11295	8G	
W75-11216	4A	W75-11295	8G	
W75-11217	5C			
W75-11218	5C	W75-11297	8G	
W75-11219	5B	W75-11298	8G	
W75-11220	21	W75-11299	8C	
W75-11221	5C	W75-11300	2D	
W75-11222	5C	W75-11301	2E	
W75-11223	5C	W75-11302	7C	
W75-11224	5C	W75-11303	2A	
	5C	W75-11304	2B	
W75-11225		W75-11305	2E	
W75-11226	2C		2E	
W75-11227	5C	W75-11306		
W75-11228	5F	W75-11307	2E	
W75-11229		W75-11308	2E	
W75-11230		W75-11309	2B	
W75-11231	5G	W75-11310	5B	
W75-11232	5C	W75-11311	5B	
W75-11233	5C	W75-11312	2H	
W75-11234		W75-11313	4D	
W75-11235		W75-11314	5D	
		W75-11315	5D	
W75-11236		W75-11316	5C	
W75-11237				
W75-11238		W75-11317	5D	
W75-11239		W75-11318		
W75-11240		W75-11319		
W75-11241	5D	W75-11320	5D	

W75-11321 5D W75-11322 5D W75-11323 5D W75-11324 5D W75-11325 5D W75-11326 5D W75-11327 5D W75-11328 5D W75-11329 5D W75-11330 5D W75-11331 5D W75-11332 5D W75-11333 5D W75-11334 5D 5D W75-11335 W75-11336 5A W75-11337 5A W75-11338 5D W75-11339 5D 5A W75-11340 W75-11341 5A W75-11342 5A W75-11343 5A W75-11344 5A W75-11345 5D W75-11346 5B W75-11347 5D W75-11348 5D W75-11349 W75-11350 5G

ABSTRACT SOURCES

sou	RCE	ACCESSION NUMBER	TOTAL
Α.	CENTERS OF COMPETENCE		
	Cornell University, Policy Models for Water Resources Systems	W75-1117411186	13
	Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W75-1095510996 1099811005 1100711008 1101011020 1102211023 1110111105 1110711134 11173	95
	Illinois State Water Survey, Hydrology	W75-1090910915 10917 1091910925 10927 1106111062 1113711156 1115811169	50
	Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry	W75-1131311318 1132011350	37
	National Water Well Association, Water Well Construction Technology	W75-11255 1125711267 1126911299	43
	University of Arizona, Arid Land Water Resources	W75-1086010884 1088610892 1089410897 1109511100	42
	University of Florida, Eastern U. S. Water Law	W75-1085610857 10859	3
	University of Wisconsin, Eutrophication	W75-1118711225 1122711240	53
	University of Wisconsin, Water Resources Economics	W75-1124611254	9

ABSTRACT SOURCES

sou	IRCE REFUGE WHEEKSTON	ACCESSION NUMBER	TOTAL
В.	STATE WATER RESOURCES RESEARCH INSTITUTES	W75-1085110853 1089810899 1090210908 1103511057 1109211093 11172 1124111245	43
С.	OTHER		
	BioSciences Information Service	W75-10858, 10885 10893, 10916 10918, 10926 10928, 10997 11006, 11009	21
		11021, 11024 11106, 11157 1117011171 1122611256 11268, 11312 11319	
	Commonwealth Scientific and Industrial Research Organization, Australia	W75-1130011311	12
	Effects of Pollutants on Aquatic Life (Katz)	W75-1102511034 1107811091 1113511136	26 26
	Ocean Engineering Information Service (Patents)	W75-1106311077	15
	Office of Water Research and Technology	W75-10854 1090010901 1105811060	6
	Rensselaer Polytechnic Institute	W75-11094	1 mount
	U. S. Geological Survey	W75-1092910954	26

± U. S. GOVERNMENT PRINTING OFFICE: 1975 € - 210-951 (8)

L

+3